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EASTERN OR "NEAR-BY" EDITION.

HANDY NOTES & QUERIES.

A MANUAL OF USEFUL INFORMATION

COMPILED

Henry Hopkins

HARDWARE TINWARE METALS

NEWLY ENLARGED AND REVISED TO DATE.

"MULTUM IN PARVO."

HANDY NOTES AND QUERIES.

A MANUAL OF USEFUL INFORMATION,

OF ESPECIAL IMPORTANCE TO DEALERS IN

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GAS-FITTERS' AND PLUMBERS' MATERIALS,

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——INCLUDING ALSO——

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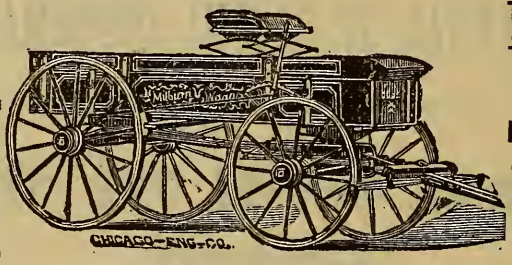

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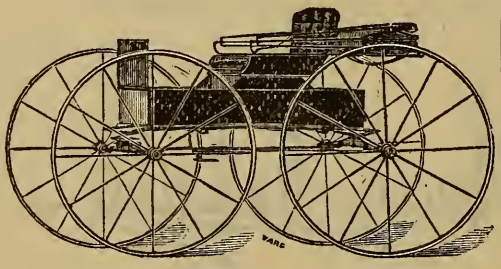

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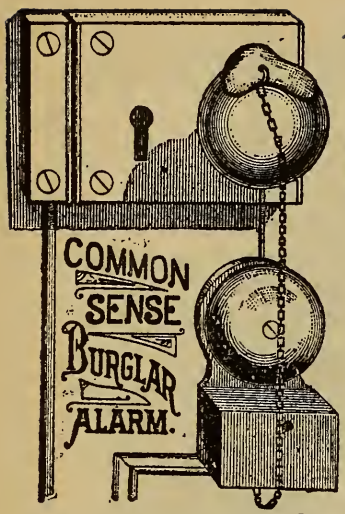

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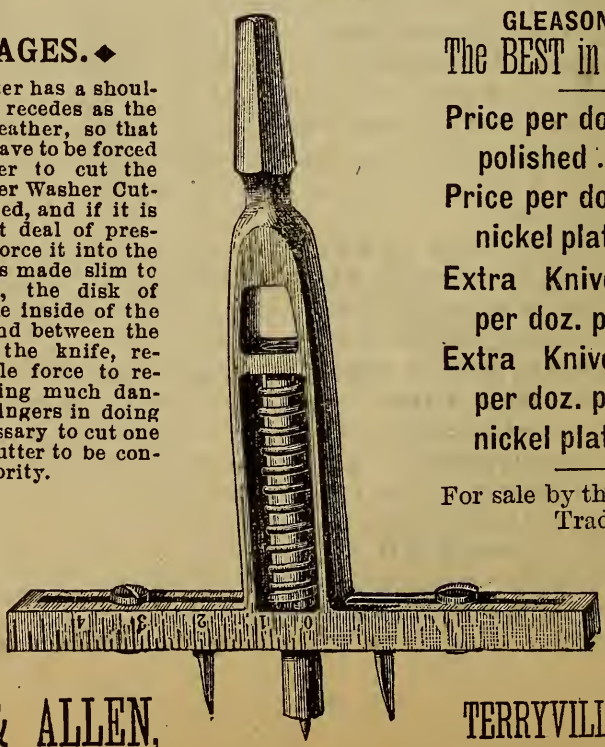

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PREFACE.

This Publication has received at all hands a cordial welcome and grateful preservation. The contents represent months of research and solicitation, of patient observation and incessant labor; and although the Book was originally compiled for Personal use, the knowledge that it would be found useful to EVERY dealer in Hardware and Metals, has caused its publication and extended distribution under the advertising patronage of so many Representative Houses.

Its future value can only be assured by making those Advertisers believe that it fills its mission of usefulness, and is kept by the Dealer who receives it, and who, in his quest for information corresponds with its many Advertisers, asking them for Catalogues and quotations; at the same time increasing the value of "Handy Notes and Queries," by stating it was among its pages the advertisement was seen which suggested the application.

The necessity for a Handy Book of Reference similar to this has been manifest for a great many years; and that such a compilation would prove of undoubted utility, has been often experienced by dealers in the various articles to which this work refers.

It is no doubt true that many books have been already published, which, singly or collectively, contain nearly all the items of information carefully embodied in this, but most of them are works of limited circulation, not readily obtained, and frequently costing a price that places them beyond the reach of many dealers most apt to need the information.

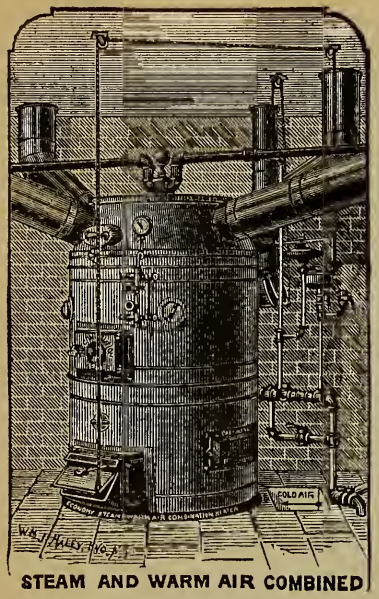
This work has been compiled from a multitude of sources with a great degree of care, and the information herein contained will be found quite reliable, and from the scarcity of similar publications, should naturally recommend its careful preservation.

By comparison with Haswell, Trautwine and other authorities, these tables will be more easily understood by practical mechanics, and consequently found susceptible of an immediate simple demonstration without going thro' prescribed forms of computation, natural enough to those whose education has been of a technical character, but thoroughly bewildering to most of us who have "risen from the ranks."

Wherever possible I have refrained from following the "Haswell" method of expressing all sizes by decimal notation; thinking it simpler to say 3-16, instead of .1875; 5-16, instead of .3125; &c., the desired information being more easily obtained without the necessity of using mentally an unfamiliar process of reduction.

My principal object has been to be of some service to those following my own business, feeling confident from the assistance I have myself so frequently received, by having these "Handy Notes" within reach will also be appreciated by them. Thus they may often save many moments of anxious worry over unexpected problems that may occur in every day work.

H. H.



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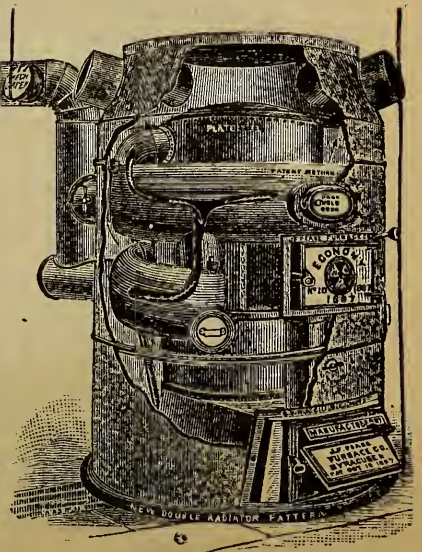

THE ECONOMY FURNACE.

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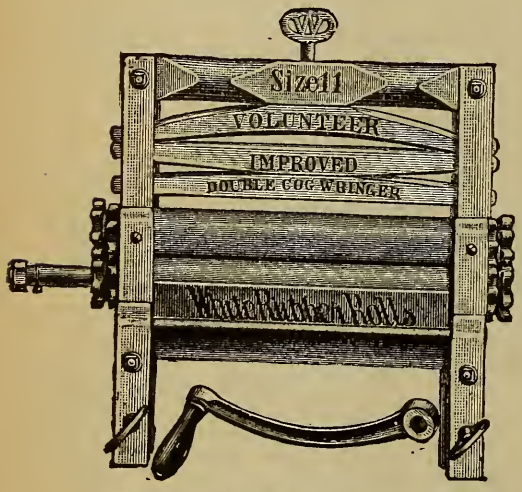

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BUSINESS LAW IN DAILY USE.

The following compilation of business law contains the essence of a large amount of legal verbage:

If a note is lost or stolen, it does not release the maker; he must pay it, if the consideration for which it was given and the amount can be proven.

Notes bear interest only when so stated.

Principals are responsible for the acts of their agents.

Each individual in a partnership is responsible for the whole amount of the debts of the firm, except in cases of special partnership.

Ignorance of the law excuses no one.

The law compels no one to do impossibilities.

An agreement without consideration is void.

A note made on Sunday is void.

Contracts made on Sunday cannot be enforced.

A note by a minor is void.

A contract made with a minor is void.

A contract made with a lunatic is void.

A note obtained by fraud, or from a person in a state of intoxication, cannot be collected.

It is a fraud to conceal a fraud.

Signatures made with a lead pencil are good in law.

A receipt for money is not always conclusive.

The acts of one partner bind all the rest.

"Value received" is usually written in a note, and should be, but is not necessary. If not written it is presumed by the law, or may be supplied by proof.

The maker of an "accommodation" bill or note (one for which he has received no consideration, having lent his name or credit for the accommodation of the holder) is not bound to the person accommodated, but is bound to all other parties, precisely as if there was a good consideration.

No consideration is sufficient in law if it be illegal in its nature.

Checks or drafts must be presented for payment without unreasonable delay.

Checks or drafts should be presented during business hours, but in this country, except in the case of banks, the time extends through the day and evening.

If the drawee of a check or draft has changed his residence, the holder must use due or reasonable diligence to find him.

If one who holds a check as payee or otherwise, transfers it to another, he has a right to insist that the check be presented that day, or, at farthest, on the following day.

A note indorsed in blank (the name of the indorser only written) is transferable by delivery, the same as if made payable to bearer.

If the time of payment of a note is not inserted, it is held payable on demand.

The Compiler of this Manual of useful information can be communicated with at the following address:

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BUSINESS LAW IN DAILY USE.----Continued.

The time of payment of a note must not depend upon a contingency. The promise must be absolute.

A bill may be written upon any paper, or substitute for it, either with ink or pencil.

The payee should be distinctly named in the note, unless it is payable to bearer.

An indorsee has a right of action against all whose names were on the bill when he received it.

If the letter containing a protest of non-payment be put into the post office, any miscarriage does not affect the party giving notice.

Notice of protest may be sent either to the place of business or of residence of the party notified.

The holder of a note may give notice of protest either to all the previous indorsers or only to one of them; in case of the latter he must select the last indorser, and the last must give notice to the last before him, and so on. Each indorser must send notice the same day or the day following. Neither Sunday or legal holiday is to be counted in reckoning the time in which notice is to be given.

The loss of a bill or note is not sufficient excuse for not giving notice of protest.

If two or more persons as partners are jointly liable on a note or bill, due notice to one of them is sufficient.

If a note or bill is transfered as security, or even as payment of a pre-existing debt, the debt revives if the bill or note be dishonored.

An indorsement may be written on the face or back.

An indorser may prevent his own liability to be sued by writing "without recourse," or similar words.

All claims which do not rest upon a seal or judgment must be sued within six years from the time when they arise.

Part payment of a debt which has passed the time of statutory limitation revives the whole debt, and the claim holds good for another period of six years from the date of such partial payment.

A verbal promise to pay, made without condition, is generally held as sufficient to revive a claim otherwise shut out by the law of limitation.

If, when a debt is due, the debtor is out of the State, the "six years" do not begin to run until he returns. If he afterward leave the State, the time forward counts the same as if he remained in the State.

An oral agreement must be proved by evidence. A written agreement proves itself. The law prefers written to oral evidence because of its precision.

No evidence may be introduced to contradict or vary a written contract; but it may be received in order to explain it, when such contract is in need of explanation.

Bills of Exchange, Drafts, Acceptances.

A Bill of Exchange or Draft is an order drawn by one person or firm upon another, payable either at sight or at a stated future time.

It becomes an "Acceptance" when the party upon whom it is drawn writes across the face "Accepted," and signs his name thereto, and is negotiable and bankable the same as a note, and subject to the same laws.

In many States both Sight and Time drafts are entitled to three days grace, the same as notes; but if made in form of a bank check, 'pay to," without the words "at sight," it is payable on presentation without grace.

Demand Notes are payable on presentation without grace, and bear legal interest, after a demand has been made, if not so written. An endorser on a demand note is holden only for a limited time, variable in different States.

A Negotiable Note must be made payable either to bearer, or be properly endorsed by the person to whose order it is made. If the endorser wishes to avoid responsibility, he can endorse "without recourse."

A Joint Note is one signed by two or more persons, who each become liable for the whole amount.

Three Days' Grace are allowed on all time notes, after the time for payment expires; if not then paid, the endorser, if any, should be legally notified, to be holden.

Foreign Exchange, Value of U. S. Coins, etc.

The value of One Pound Sterling or an English Sovereign, compared with old U. S. coins, is $4.444, but Congress has, from time to time, reduced the weight and purity of U. S. coins, making their value as metals less than their value as coins, and has established the present legal value of a Pound Sterling at $4.84. Exchange is based on the old or nominal value of a Pound, so that when exchange is said to be at 9 per cent. premium, it is then at par value; when below 9 per cent., it is below par; and when above 9 per cent., above par, etc.

Copartnerships.

Partnerships may be either general or special. In general partnerships, money invested ceases to be individual property. Each member is made personally liable for the whole amount of debts incurred by the company. The company is liable for all contracts or obligations made by individual members.

Special Partners are not liable beyond the amount contributed.

A person may become a partner by allowing people generally to presume that he is one, as, by having his name on the sign, or parcels, or in the bills used in the business.

A share or specific interest in the profits or loss of a business, as remuneration for labor, may involve one in the liability of a partner.

In case of Bankruptcy, the joint estate is first applied to the payment of partnership debts, the surplus only going to the creditors of the individual estate.

A Dissolution of partnership may take place under express stipulations in the articles of agreement, by mutual consent, by the death or insanity of one of the firm, by award of arbitrators, or by court of equity in cases of misconduct of some member of the firm

A partner signing his individual name to negotiable paper, which is for the use of the partnership firm, binds all the partners thereby. Negotiable paper of the firm, even though given on private account by one of the partners, will hold all the partners of the firm when it passes into the hands of holders who are ignorant of the fact attending its creation.

Partnership effects may be bought and sold by a partner; he may make contracts; may receive money; endorse, draw, and accept bills and notes; and while this may be for his own private account, if it apparently be for the use of the firm, his partners will be bound by his action, provided the parties dealing with him were ignorant of the transaction being on his private account; and thus representation or misrepresentation of a partner, having relation to business of the firm, will bind the members in the partnership.

In case of Death, the surviving partners must account to the representatives of the deceased..

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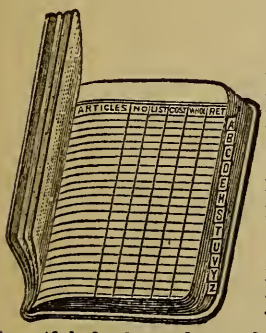

BUSHNELL'S PRICE BOOK is a neat, substantially bound book of 200 pages, made of first-class stock, conveniently and tastefully indexed, handsomely ruled and headed. It is manufactured for the publisher by one of the best blank-book manufacturers in New York, and no expense has been spared to make it the finest book in the market, the neatness and convenience of which will commend it at once.

THERE IS NO OTHER PRICE BOOK IN THE MARKET, SOLD AT ANYTHING LIKE AN EQUAL FIGURE, THAT COMPARES WITH IT. It was developed by years of experience in business, and the need of a *practical* price book was the means of bringing this before the public.

To the business man who never kept a price book, a few weeks' trial of it will demonstrate its advantages, and he will never dispense with it.

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Poisons and their Antidotes.

ARSENIC.—Use the stomach pump instantly; otherwise, give 20 grains sulphate of zinc in a little warm water to produce vomiting, or a large table spoonful of mustard in warm water. Meanwhile procure some *hydrated sesquioxide of iron* and give a tablespoonful of it with water every five or ten minutes until six doses are taken. *Dialyzed iron* is also efficient.

AQUA AMMONIA, or HARTSHORN, if taken undiluted is a violent poison. Give *Vinegar*, instantly, mixed with a little water, this acts by neutralization. Vegetable oils, in large quantity, furnish the next best antidote, the ammonia acting upon them to form Soap.

ACONITE.—Give an emetic of mustard or sulphate of zinc, or use the stomach pump, instantly, then give stimulants, whiskey, brandy, gin or rum, &c.

ACID—NITRIC, MURIATIC, or SULPHURIC.—If either of these be swallowed, not a moment is to be lost. The best remedy is to fill the patient FULL of *Calcined Magnesia* stirred up in water, to the consistency of very thin paste; or, give half an ounce of soap shavings in a pint of water. If neither are at hand give chalk or whiting, in water, or even pound fine some of the white plastering from the wall and give in water.

BELLADONNA, HYOSCYAMUS, STAMONIUM, and CONIUM are all narcotics, and the treatment is the same as for opium; *especially the strong coffee.*

CANTHARIDES (Spanish Flies).—Give large doses of sweet oil, sugar and water, or milk. To relieve the strangury and scalding of urine whice it occasions, give camphor, 10 to 15 drop doses in water.

CORROSIVE SUBLIMATE, (Bed bug poison).—Mix up quickly the *whites of a dozen eggs*, with a quart of cold water, give a cupful of the mixture every two minutes till the stomach can hold no more. If you have not eggs enough use what you have and make up the deficiency with *milk*. Wheat flour, mixed with water, is good. Use the stomach pump if it can be had quickly.

CHARCOAL GAS, SULPHURETTED HYDROGEN, or CARBONIC ACID GAS.—Use cold shower bath and give Aconite in drop doses, in a spoonful of water. The effects of *Coal gas* are best antidoted by copious draughts of vinegar and water.

OXALIC ACID.—Give *Magnesia* in water as quickly as possible. When not to be had, use chalk, lime or saleratus. Use the stomach pump if at hand. Soap suds or alkalies are of no use with this Acid.

OPIUM, MORPHINE and LAUDANUM.—Use the stomach pump, if possible; if not, a powerful emetic, as sulphate of zinc; or, give the mustard emetic and tickle the palate. If drowsiness comes on, take the patient into the open air; dash water into the face, *by all means keep him walking.* If once allowed to fall asleep it may be impossible to arouse him. Strong coffee, taken hot, antidotes after the stomach has been emptied.

PRUSSIC ACID.—This is the deadliest of all known poisons. One drop of the *pure acid* will cause instantaneous death. If any of its products be taken and the result is not immediately fatal, resort to the cold shower bath, inhalation of diluted *aqua ammonia* vapor and give solution of carbonate of potass, 20 grains to a glass of water, or ammonia diluted with six times the bulk of water, freely.

SUGAR OF LEAD, (Acetate of Lead).—Give a ground mustard emetic; or, 20 grains sulphate of zinc in a glass of water; afterwards, large dose of epsom salts.

STRYCHNINE or NUX VOMICA, are rapid and deadly poisons, generally proving fatal, in spite of treatment. If emetics are given and the stomach emptied quickly enough, and if the patient is not attacked with convulsions within two hours, he will generally be safe. An abundance of sweet milk is recommended, also strong coffee, as for opium poisoning.

STRONG LYE.—Sometimes swallowed by children. The remedy is *vinegar, or oil,* the former by converting the lye into acetate of potash, the latter by forming soap; neither of which materially injures the stomach.

VERDIGRIS.—This most frequently poisons by its formation upon copper vessels used in cooking. Give an *emetic* instantly, and then two teaspoonfuls of *Carbonate of Soda,* in a tumbler full of water and repeat in ten minutes. Whites of eggs in water are also proper.

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60	8.33	10.00	11.66	13.33	16.66
65	7.69	9.23	10.76	12.30	15.38
70	7.14	8.57	10.00	11.42	14.28
75	6.66	8.00	9.33	10.66	13.35
80	6.25	7 50	8.75	10.00	12.50
82½	6.06	7.27	8.48	9.69	11.12
85	5.88	7.05	8.23	9.41	11.76
87½	5.71	6.85	8.00	9.14	11.42
90	5.55	6.66	7.77	8.88	11.11
92½	5.40	6.48	7.56	8.64	10.80
95	5.26	6.31	7.36	8.42	10 52
96	5.20	6.25	7.29	8.33	10.41
97	5.15	6.18	7.21	8.24	10.30
97½	5.12	6.15	7.17	8.20	10.25
98	5.10	6.12	7.14	8.16	10.20
99	5.05	6.06	7.07	8.08	10.10
100	5.00	6.00	7.00	8.00	10.00
101	4.95	5.94	6.93	7.92	9.90
102	4.90	5.88	6.86	7.84	9.80
103	4.85	5.82	6.79	7.76	9.70
104	4.80	5.76	6.73	7.69	9.61
105	4.76	5.71	6.66	7.61	9.52
110	4.54	5.45	6.36	7.27	9.09
115	4.34	5.21	6.08	6.95	8.69
120	4.16	5.00	5.83	6.66	8.33
125	4.00	4.80	5.60	6.40	8.00
130	3.84	4.61	5.38	6.15	7.69
135	3.70	4.44	5.18	5 92	7.40
140	3.57	4.28	5.00	5.71	7.14
145	3.44	4.13	4.82	5.51	6.89
150	3.33	4.00	4.66	5.33	6.66

Interest Rules.

FOUR PER CENT.—Multiply the principal by the number of days to run; separate the right hand figure from product, and divide by 9.

FIVE PER CENT.—Multiply by number of days, and divide by 72.

SIX PER CENT.—Multiply by number of days; separate right hand figure, and divide by 6.

SEVEN AND THREE-TENTHS PER CENT.—Multiply by number of days, and double the amount so obtained. On $100 the interest is just two cents per day.

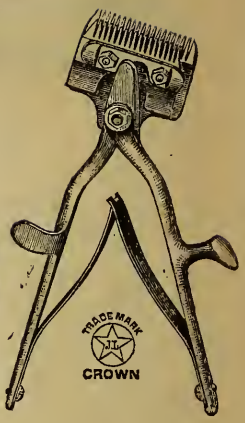
EIGHT PER CENT.—Multiply by number of days, and divide by 45.

NINE PER CENT.—Multiply by number of days; separate right hand figure, and divide by 4.

TEN PER CENT.—Multiply by number of days, and divide by 36.

TWELVE PER CENT.—Multiply by number of days; separate right hand figure, and divide by 3.

PHIPPS AND BURMAN



Sole Manufrs. for Patentees

Every "STAR BRAND"

CLIPPER

Carefully Examined and Tested.

The superior steel and improved methods of tempering and grinding make the "Star Brand" Clippers Hold their Edge Longer than any others in the market.

LARGEST VARIETY. FINEST QUALITY. LATEST IMPROVEMENTS.

Jesse Lee & Sons, Sole Agents,

37 SOUTH FOURTH ST.,

PHILADELPHIA.

JESSE JONES & CO.

No. 615 COMMERCE ST.

PHILADELPHIA Pa.

HARDWARE SHELF BOXES

MADE OF WOOD WITHOUT NAILS OR SCREWS.

UNBREAKABLE

SEND FOR CATALOGUE.

PAPER BOXES ALL KINDS FOR HARDWARE.

SEND FOR CIRCULAR SHOWING WHAT PEOPLE THINK OF THEM, WHO ARE AND HAVE BEEN USING THEM FOR YEARS.

Simple Method of Calculating Interest.

We take 6 per cent. as basis for calculating all rates.

Multiply the amount by number of days and divide by 6000; or, which is the same thing, multiply by number of days, remove the decimal point three figures to the left and divide by 6. This gives the interest at 6 per cent.

For	2 per cent.	take	one-third.
For	3 per cent.	take	one-half.
For	4 per cent.	*deduct*	one-third.
For	5 per cent.	*deduct*	one-sixth.
For	7 per cent.	*add*	one-sixth.
For	8 per cent.	*add*	one-third.
For	9 per cent.	*add*	one-half.
For	10 per cent.	*add*	two-thirds.

The following example shows the simplicity:

Interest on $950.40 for 212 days.

950.40
212
190080
95040
190080
6) 201.484.80
33.58

Interest @ 6 per cent,		33.58
" " 2 " "	⅓ of 33.58	11.19
" " 3 " "	½ of 33.58	16.79
		33.58
" " 4 " "	⅕ off 11.19	22.39
		33.58
" " 5 " "	⅙ off 5.59	27.99
		33.58
" " 7 " "	add ⅙ 5.59	39.17
		33.58
" " 8 " "	add ⅓ 11.19	44.77
		33.58
" " 9 " "	add ½ 16.79	50.37
		33.58
" " 10 " "	add ⅔ 22.38	55.96

ANY rate can be calculated upon the same principle.

Contributed by Jesse Lee and Son, Philadelphia, Pa.

Time at which Money Doubles at Interest.

Rate per cent.	Simple Interest.	Compound Interest.
2	50 years.	35 years 1 day.
2½	40 years.	28 years 26 days.
3	33 years 4 months.	23 years 164 days.
3½	28 years 208 days.	20 years 54 days.
4	25 years.	17 years 246 days.
4½	22 years 81 days.	15 years 273 days.
5	20 years.	15 years 75 days.
6	16 years 8 months.	14 years 327 days.
7	14 years 104 days.	10 years 89 days.
8	12½ years.	9 years 2 days.
9	11 years 40 days.	8 years 16 days.
10	10 years.	7 years 100 days.

ONE DOLLAR LOANED 100 YEARS at Compound Interest would amount to the following sum:

1 per cent	$2.75	12 per cent	$84,675.00
3 " "	19.25	15 " "	1,174,405.00
6 " "	340.00	18 " "	15,145,207.00
10 " "	13,809.00	24 " "	2,551,799,404.00

Interest Laws and Statutes of Limitations.

STATES AND TERRITORIES.	INTEREST LAWS.		STATUTES OF LIMITATIONS.			STATES AND TERRITORIES.	INTEREST LAWS.		STATUTES OF LIMITATIONS.		
	Legal rate.	Rate allow'd by contract.	Judgments, Years.	Notes, Years.	Open acct's Years.		Legal rate.	Rate allow'd by contract.	Judgments, Years.	Notes, Years.	Open acct's, Years.
	per cent.	*per cent.*					*per cent.*	*per cent.*			
Alabama	8	8	20	6	3	Missouri	6	10	10	10	5
Arkansas	6	10	10	5	3	Montana	10	Any rate.	6	6	2
Arizona	10	Any rate.	4	4	2	Nebraska	7	10	5	5	4
California	7	Any rate.	5	4	2	Nevada	10	Any rate.	6	6	4
Colorado	10	10	6	6	6	New Hampshire	6	6	20	6	6
Connecticut	6	†	16	16	6	New Jersey	6	6	20	6	6
Dakota	7	12	5	6	6	New Mexico	6	12	15	6	4
Delaware	6	6	20	6	3	New York	6	6*	20	6	6
Dist. of Columbia	6	10	12	3	3	North Carolina	8	8	10	3	3
Florida	8	Any rate.	20	3	2	Ohio	6	8	5	15	6
Georgia	7	8	7	6	4	Oregon	8	10	10	6	1
Idaho	10	18	6	5	4	Pennsylvania	6	6	5	6	6
Illinois	6	8	7	10	5	Rhode Island	6	Any rate.	20	6	6
Indiana	6	6	10	10	6	South Carolina	7	10	20	6	6
Iowa	7	10	20	10	5	Tennessee	6	6	10	6	6
Kansas	7	12	5	5	3	Texas	8	12	15	4	2
Kentucky	6	6	15	15	5	Utah	10	Any rate.	5	4	2
Louisiana	5	8	10	5	3	Vermont	6	6	8	6	6
Maine	6	Any rate.	20	6	6	Virginia	6	12	10	5	2
Maryland	6	6	12	3	3	Washington Terr'y.	10	Any rate.	6	6	3
Massachusetts	6	Any rate.	20	6	6	West Virginia	6	†	10	10	5
Michigan	7	10	6	6	6	Wisconsin	7	10	20	6	6
Minnesota	10	Any rate.	10	6	6	Wyoming	8	Any rate.	5	5	4
Mississippi	6	10	7	6	3						

*New York has by a recent law legalized any rate of interest on call loans of $5000 or upwards, on collateral security.
†No usury, but over 6 per cent. cannot be collected by law.

NORTHFIELD KNIFE CO.,

MANUFACTURERS OF

POCKET CUTLERY

WITH HAND-FORGED BLADES ONLY,

Shears and Razors,

NORTHFIELD, CONN.

PREMIUMS AWARDED FOR EXCELLENCE,

Centennial Exhibition, Phila., 1876. *Exposition Universelle, Paris, 1878.* *International Exhibition, Melbourne, 1881.*

To the Hardware Merchant.

DEAR SIR:

CAN WE SEND YOU A SAMPLE OF OUR SPECIALTY SINGLE HARNESS FOR YOUR INSPECTION? WE WANT TO ASTONISH YOU. THIS HARNESS IS THE PRODUCTION OF YEARS OF FIGURING TO MAKE THE BEST HARNESS EVER KNOWN FOR THE MONEY. IT IS MADE FROM OAK STOCK, HAND-STITCHED, HANDSOME FULL NICKEL OR IMITATION RUBBER, GOLD-FINISHED MOUNTINGS; SINGLE STRAP, OR FOLDED AND STITCHED STYLE. JUST THE HARNESS FOR AN ELEGANT TURN-OUT. WE WANT YOU TO SEE A SAMPLE SET WHICH YOU CAN KEEP AT $20, $5 LESS THAN PRICE, OR RETURN AT OUR EXPENSE. IN DOUBLE STYLE, WITH COLLARS AND HAMES, OR STOLE'S PAT. BREAST COLLARS, $35, $10 LESS THAN PRICE. PLEASE ANSWER IF WE CAN SEND A SAMPLE, YES OR NO, AND OBLIGE,

NATIONAL HARNESS CO., Wholesale Manufacturers,
14-24 Wells St., Buffalo, N. Y.

Collar and Hames instead of Breast Collar, $2 extra, on Single Harness.

Total Value of Articles by the Piece, Reckoned from 1 to 1 Dozen.

1.....	8⅓	10 5/12	12½	14 7/12	16⅔	18¾	20 5/6	22 1/12	25	29⅙	31¼	33⅓	35 5/12	37½	39 7/12	41⅔	43¾	45 5/6	47 1/12	50
2.....	17	21	25	29	33	38	42	46	50	58	63	67	71	75	79	83	88	92	96	1.00
3.....	25	31	38	44	50	56	63	69	75	88	94	1.00	1.06	1.13	1.19	1.25	1.31	1.38	1.44	1.50
4.....	33	42	50	56	67	75	83	92	1.00	1.17	1.25	1.33	1.42	1.50	1 58	1.67	1.75	1.83	1.92	2.00
5.....	42	52	63	73	83	94	1.04	1.15	1.25	1.46	1.56	1.67	1.77	1.88	1.98	2.08	2.19	2.29	2.40	2.50
6.....	50	63	75	88	1.00	1.13	1.25	1.38	1.50	1.75	1.88	2.00	2.13	2.25	2.34	2.50	2.63	2.75	2.87	3.00
7.....	58	73	88	1.02	1.17	1.31	1.46	1.60	1.75	2.04	2.19	2.33	2.48	2.63	2.77	2.92	3.06	3.21	3.35	3.50
8.....	67	83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.33	2.50	2.67	2.83	3.00	3.17	3.33	3.50	3.67	3.83	4.00
9.....	75	94	1.13	1.29	1.50	1.69	1.88	2.06	2.25	2.63	2.81	3.00	3.19	3.38	3.56	3.75	3.94	4.13	4 31	4.50
10.....	83	1.04	1.25	1.46	1.67	1.88	2.08	2.29	2.50	2.92	3.13	3.33	3.54	3.75	3.96	4 17	4.38	4.58	4.79	5.00
11.....	92	1.15	1.38	1.60	1.83	2.06	2.29	2.52	2.75	3.21	3.44	3.67	3.89	4.13	4.23	4.58	4.81	5.04	5.27	5.50
12.....	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00

1.....	52 1/12	54⅙	56¼	58⅓	60 5/12	62½	64 7/12	66⅔	68¾	70 5/6	72 1/12	75	77 1/12	79⅙	81¼	83⅓	87½	91⅔	95 5/6	1.00
2.....	1.04	1.08	1.13	1.17	1.21	1.25	1.29	1.33	1.38	1.42	1.46	1.50	1.54	1.58	1.63	1.67	1.75	1.83	1.92	2.00
3.....	1.56	1.63	1.69	1.75	1.81	1.88	1.94	2.00	2.06	2.13	2.19	2.25	2.31	2.38	2.44	2.50	2.63	2.75	2.88	3.00
4.....	2.08	2.17	2.25	2.33	2.42	2.50	2.58	2.67	2.75	2.83	2 92	3.00	3.08	3.17	3.25	3.33	3.50	3.67	3.83	4.00
5.....	2.60	2.71	2.81	2.92	3.02	3.13	3.23	3.33	3.44	3.54	3.65	3.75	3.85	3.96	4.06	4.17	4.38	4.58	4.79	5.00
6.....	3.13	3.25	3.38	3.50	3.63	3.75	3.88	4.00	4.13	4.25	4.38	4.50	4.63	4.75	4.88	5.00	5.25	5.50	5.75	6.00
7.....	3.65	3.79	3.94	4.08	4.23	4.38	4.52	4.67	4.81	4.96	5.10	5.25	5.40	5.54	5.69	5.83	6.13	6.42	6.71	7.00
8.....	4.17	4.33	4.50	4.67	4.93	5.00	5.17	5.33	5.50	5.67	5.83	6.00	6.15	6.33	6.50	6.67	7.00	7.33	7.66	8.00
9.....	4.69	4.88	5.06	5.25	5.44	5.63	5.81	6.00	6.19	6.38	6.56	6.75	6.94	7.13	7.31	7.50	7.88	8.25	8.62	9.00
10.....	5.21	5.42	5.63	5.83	6.04	6.25	6.46	6.67	6.88	7.08	7.29	7.50	7.71	7.92	8.13	8.33	8.75	9.17	9.58	10.00
11.....	5.73	5 96	6.19	6.42	6.65	6.88	7.11	7.33	7.56	7.79	8.02	8.25	8.48	8.71	8.94	9.17	9.63	10.08	10.54	11.00
12.....	6.25	6.50	6.75	7.00	7.25	7.50	7.75	8.00	8.25	8.50	8.75	9.00	9.25	9.50	9.75	10.00	10.50	11.00	11.50	12.00

NORWICH LOCK MAN'G CO.,

NORWICH, CONN., U. S. A.,

MANUFACTURERS OF

DOOR LOCKS AND KNOBS

OF EVERY DESCRIPTION.

BRONZE HARDWARE,

A full and extensive line in all the popular styles of elaborate design and perfect finish.

BRASS AND BRONZED PADLOCKS,
In New and Salable Patterns.

CAST and WROUGHT IRON PADLOCKS,
With Malleable or Flat Steel Keys.

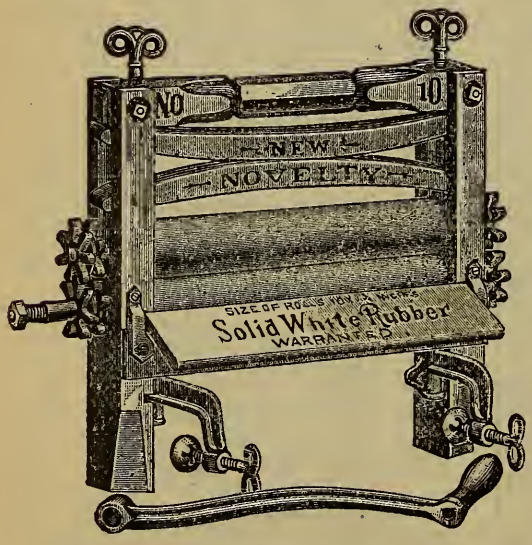
And a Large and Constantly Increasing line of

BUILDERS' HARDWARE.

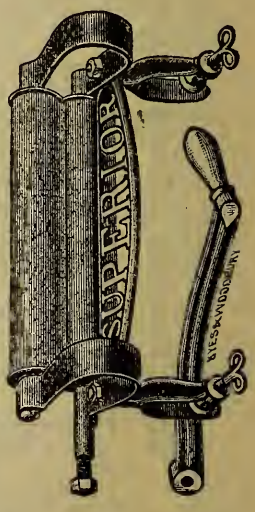
Including all the Latest Styles, and consisting of

Bronzed and Solid Bronze Door Butts and Handles, Sash Butts, Shutter Bars, Sash Lifts, Drawer Pulls, Door Bolts, Cupboard Turns and Screen Door Catches.

NOVELTY AND SUPERIOR WRINGERS.



Have Patent Adhesive Rolls which are Fully Warranted and so Stamped; Apron or Clothes Guide to Carry the Clothing over the Side of the Tub into the Clothes Basket.



Fully Illustrated Catalogue of Thirty Different Styles and Sizes Sent Free on Application.

BAILEY WRINGING MACHINE CO.,

WOONSOCKET, R. I.

WEIGHTS AND MEASURES.

Avoirdupois Weight.

The Grain is the same in Troy, Apothecaries and Avoidupois Weights.

The standard avoirdupois pound is the weight of 27.7015 cubic inches of distilled water weighed in the air at 35.85 degrees Fahr., barometer at 30 inches.

27.343 grains = 1 drachm.

drachms.	ozs.	lbs.	qrs.	cwt.	ton.	French grammes.
1 =	.0625 =	.0039 =	.000139 =	.000035 =	.00000174 =	1.771846
16 =	1 =	.0625 =	.00223 =	.000558 =	.000028 =	28.34954
256 =	16 =	1 =	.0357 =	.00893 =	.000447 =	453.59
7168 =	448 =	28 = 1	=	.25 =	.0125 =	12700
28672 =	1792 =	112 = 4	= 1	=	.05 =	50802
573440 =	35840 =	2240 = 80	= 20	= 1	=	1016040

A stone = 14 pounds. A quintal = 100 pounds

Troy Weight.

For Gold, Silver and Precious Metals.

grains.	dwts.	ozs.	lbs.	French grammes.
1 =	.04167 =	.00208 =	.0001736 =	.9648
24 =	1 =	.05 =	.004167 =	1.555
480 =	20 =	1 =	.0833 =	31.1035
5760 =	240 =	12 =	1 =	373.242

175 lbs. Troy = 144 Avoirdupois.
lbs. Avoirdupois X .82286 = lbs. Troy.
lbs. Troy X 1.2153 = lbs. Avoirdupois.

The jeweler's Carat is equal, in the United States, to 3.2 grains; in London, to 3.17 grains; in Paris, to 3.18.

Pure Gold is worth $20.67 per oz. Troy, or $[illegible] per oz. Avoirdupois.
" Silver " $1.36 " " $1.24 " "
Standard Gold " $18.60 " " $16.96 " "
" Silver " $1.225 " " $1.117 " "

Apothecaries' Weight.

United States and British.

20 grains..... 1 scruple.
3 scruples..... 1 drachm = 60 grains.
8 drams..... 1 ounce = 24 scruples = 480 grains.
12 ounces..... 1 pound = 96 drachms = 288 scruples = 5760 grs.

In Troy and Apothecaries' weights, the grain, ounce and pound are the same.

Long Measure.

ins.	feet.	yards.	fath.	poles.	furl.	mile.	French metres.
1 =	.083 =	.02778 =	.0139 =	.005 =	.000126 =	.0000158 =	.0254
12 =	1 =	.333 =	.1667 =	.0606 =	.00151 =	.0001894 =	.3048
36 =	3 =	1 =	5 =	.182 =	.00454 =	.000568 =	.9144
72 =	6 =	2 =	1 =	.364 =	.0091 =	.001136 =	1.8287
198 =	16½ =	5½ =	2¾ =	1 =	.025 =	.003125 =	5.0291
7920 =	660 =	220 =	110 =	40 =	1 =	.125 =	201.16
63360 =	5280 =	1760 =	880 =	320 =	8 =	1 =	1609.315

A cable's length = 120 fathoms.

A square mile is 640 acres.
A league is three miles.
The term "Sabbath Day's Journey" means 1,155 yards.
A day's journey is 33⅓ miles.
A fathom is six feet.

A hand (horse measure) is four inches.
A palm is three inches.
A span is 10⅞ inches.
A cubit is two feet.
A great cubit is 11 feet.
A pace is three feet.

Surveying Measure (Lineal).

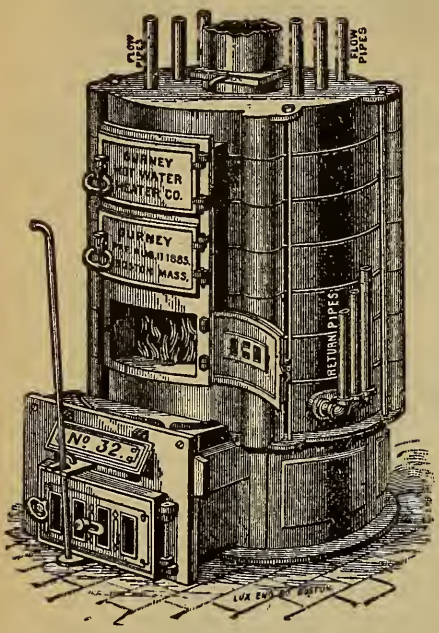
ins.	links.	feet.	yards.	chains.	mile.	French metres.
1 =	.126 =	.0833 =	.0278 =	.00126 =	.0000158 =	.0254
7.92 =	1 =	.66 =	.22 =	.01 =	.000125 =	.2012
12 =	1.515 =	1 =	.333 =	.01515 =	.000189 =	.3048
36 =	4.545 =	3 =	1 =	.04505 =	.000568 =	.9144
792 =	100 =	66 =	22 =	1 =	.0125 =	20.116
63360 =	8000 =	5280 =	1760 =	80 =	1 =	1609.315

1 knot or geographical mile = 6082.66 feet = 1854 metres = 1.152 statute mile.
1 Admiralty knot = 1.1515 statute miles = 6080 feet.

Table of Quantities.

12 units or articles,	1 dozen.	20 quires	1 ream.
12 dozen	1 gross.	2 reams	1 bundle.
20 units or articles,	1 score.	5 bundles	1 bale.
24 sheets paper,	1 quire.	Printer's token,	250 sheets.

Gurney Hot Water Heater,



FOR HEATING

Dwellings, Offices, Public Buildings and Greenhouses.

MANUFACTURED BY

GURNEY HOT WATER HEATER CO.,

237 Franklin St., Boston, Mass.

JOHN A. FISH, Managing Director.

OVER 2500 IN USE SINCE 1885.

Advantages of Hot Water Heating:

Equality of temperature throughout all parts of building. Simplicity of the apparatus—an ordinary male or female domestic fully competent to take charge. Perfectly noiseless; no snapping or gurgling noises, common with steam. Consumption of fuel 25 per cent. less than by any other mode of heating. Send for descriptive catalogue, testimonials and prices.

M. H. JOHNSON,

GEN'L SALES AGENT.

138, 140 Centre St., New York,

CURTIS & CO.,

Wrought and Cast Iron Pipe and Fittings,

FOR STEAM, WATER, GAS AND OIL.

BRASS AND IRON VALVES AND COCKS.

Railway, Steamship, Machinists', Engineers' and Factory Supplies.

138 and 140 Centre Street,

Telephone "Spring 837." New York.

W. H. RANSOM, Manager.

SELLING AGENTS FOR

Crosby Steam Gage and Valve Co., Rensselaer Straightway Gate Valves, Ideal Steam and Hot Water Radiators, Excelsior Radiators.

WEIGHTS AND MEASURES—Continued.

Square Measure.

ins.	feet.	yards.	perches.	roods.	acre.	Square metres.
1 =	.00694 =	.000772 =	.0000255 =	.00000064 =	.000000159 =	.000645
144 =	1 =	.111 =	.00367 =	.0000918 =	.000023 =	.0929
1296 =	9 =	1 =	.0331 =	.000826 =	.0002062 =	.8361
39204 =	272¼ =	30¼ =	1 =	.025 =	.00625 =	25.292
1568160 =	10890 =	1210 =	40 =	1 =	.25 =	1011.7
6272640 =	43560 =	4840 =	160 =	4 =	1 =	4046.7

100 square feet = 1 square.
1 chain wide = 8 acres per mile.
10 square chains = 1 acre.
1 hectare = 2.471143 acres.
1 square mile. = 27878400 sq. feet. = 3097600 sq. yds. = 640 acres.
Acres x .0015625 = square miles.
Sq. yds. x .000000323 = sq. miles.

A section of land is 1 mile square, and contains 640 acres
A square ½ " 147.58 " "
" ¼ " 104.355 " "
A circular " 235.504 feet in diameter.
" ½ " 166.527 " "
" ¼ " 117 752 " "

52 1-6	feet	square,	or.....	2,722½	square feet	is 1-16 acre.
73⅓	feet	square,	or.....	5,445	square	⅛ acre.
104⅓	feet	square,	or.....	10,890	square	¼ acre.
120¼	feet	square,	or.....	14,520	square	⅓ acre,
147½	feet	square,	or.....	21,780	square	½ acre.
208⅔	feet	square,	or.....	43,560	square	feet 1 acre.

Cubic Measure.

ins.	feet.	yard.	cubic metres.
1 =	.0005788 =	.000002144 =	.000016386.
1728 =	1 =	.03704 =	.028315
46656 =	27 =	1 =	.764513

A cord of wood = 128 cubic feet, being 4 feet high, 4 feet wide, and 8 feet long.
42 cubic feet = a ton of shipping.

A CUBIC FOOT IS EQUAL TO

1728 cubic inches.
.037037 cubic yard.
.803564 U. S. struck bushel of 2150.42 cubic inches.
3.21426 U. S. pecks.
7.48052 U. S. liquid galls. of 231 cub. inch.
6.42851 U. S. dry gallons.
29.92208 U. S. liquid quarts.
25.71405 U. S. dry quarts.
59.84416 U. S. liquid pints.
51.42809 U. S. dry pints.
239.37662 U. S. gills.
.26667 flour barrel of 3 struck bushels.
.23748 U. S. liquid barrel of 31½ gallons.

Dry Measure.

The Standard Bushel contains 2150.42 cubic inches, or 77.627013 pounds avoirdupois of pure water at maximum density It legal dimensions are 18½ inches Diameter inside, 19½ inches outside, and 8 inches deep; and when heaped, the cone must be 6 inches high, making a heaped bushel equal to 1¼ struck ones.

Pints.	Quarts.	Gallons.	Pecks.	Bushels.	Cubic Inches.
2 =	1 =	.250 =	.125 =	.0315 =	67.2
8 =	4 =	1 =	.5 =	.125 =	268.8
16 =	8 =	2 =	1 =	25 =	537.6
64 =	32 =	8 =	4 =	1 =	2150.42

Liquid Measure.

The standard gallon measures 231 cubic inches, or 8.33888 lbs., avoirdupois of pure water, at about 39.85 degrees Fahr., the barometer at 30 inches.

gills.								
4 =	1 pint.							
8 =	2 =	1 quart.						
32 =	8 =	4 =	1 gallon.					
1344 =	336 =	168 =	42 =	1 tierce.				
2016 =	504 =	252 =	63 =	1½ =	1 hogshead.			
2688 =	672 =	336 =	84 =	2 =	1⅓ =	1 puncheon.		
4032 =	1008 =	504 =	126 =	3 =	2 =	1½ =	1 pipe.	
8064 =	2016 =	1008 =	252 =	6 =	4 =	3 =	2 =	1 tun.

A cubic foot contains 7½ gallons.

THE METRIC SYSTEM.

WEIGHTS.

Metric Denominations and values. Names,	No. Grams.	Equivalents in Denominations in use. Weight of what quantity of water at maximum density.	Avoirdupois Weight.
Millier or tonneau	= 1,000,000	= 1 cubic meter	= 2204 6 pounds
Quintal	= 100,000	= 1 hectoliter	= 220 46 pounds
Myriagram	= 10,000	= 10 liters	= 22.046 pounds
Kilogram or kilo	= 1,000	= 1 liter	= 2.2046 pounds
Hectogram	= 100	= 1 deciliter	= 3.5274 ounces.
Dekagram	= 10	= 10 c. centimeter	= 0 3527 ounce.
Gram	= 1	= 1 c. centimeter	= 15.432 grains.
Decigram	= .1	= .1 c. centimeter	= 1 5432 grains.
Centigram	= .01	= 10 c. millimeter	= 0.1543 grain.
Milligram	= .001	= 1 c. millimeter	= 0.0154 grain.

MEASURES OF LENGTH.

Metric Denominations and Values.		Equivalents in Denominations in use.
Myriameter =	10,000 meters	= 6.2137 miles.
Kilometer =	1,000 meters	= 0.62137 m. or 3,280 feet 10 inches.
Hectometer =	100 meters	= 328 feet and 1 inch.
Dekameter =	10 meters	= 393.7 inches.
Meter =	1 meter	= 39.37 inches.
Decimeter =	.1 of a meter	= 3.937 inches.
Centimeter =	.01 of a meter	= 0.3937 inch.
Millimeter =	.001 of a meter	= 0.0394 inch.

MEASURES OF SURFACE.

Metric Denominations and Values.		Equivalents in Denomination in use.
Hectare =	10,000 square meters	= 2 471 acres.
Are =	100 square meters	= 119.6 square yards.
Centare =	1 square meter	= 1.550 square inches.

MEASURES OF CAPACITY.

Metric Denominations and Values. Names.	No. Liters.	Cubic Measure.	Equivalents in Denominations in use. Dry Measure.	Wine Measure.
Kiloliter =	1,000 =	1 cubic meter =	1.308 cubic yards =	264.17 gallons.
Hectoliter =	100 =	.1 cubit meter =	2 bush. 3.35 pks. =	26.417 gallons.
Decaliter =	10 =	10 c. decimeters =	9.08 quarts =	2.6417 gallons.
Liter =	1 =	1 c. decimeter =	0.908 quart =	1.0567 quarts
Deciliter =	.1 =	.1 c. decimeter =	6.1022 cubic inch. =	0 845 gill.
Centiliter =	.01 =	10 c.centimeters =	0.6102 cubic inch. =	0.338 fluid oz.
Milliliter =	.001 =	1 c. centimeter =	0.061 cubic inches =	0.27 fluid dr.

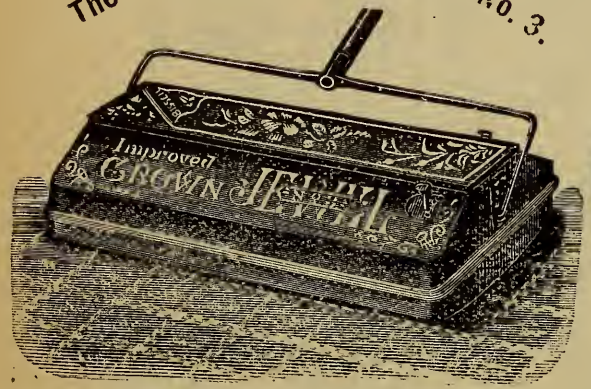
THE BISSELL CARPET SWEEPER CO.

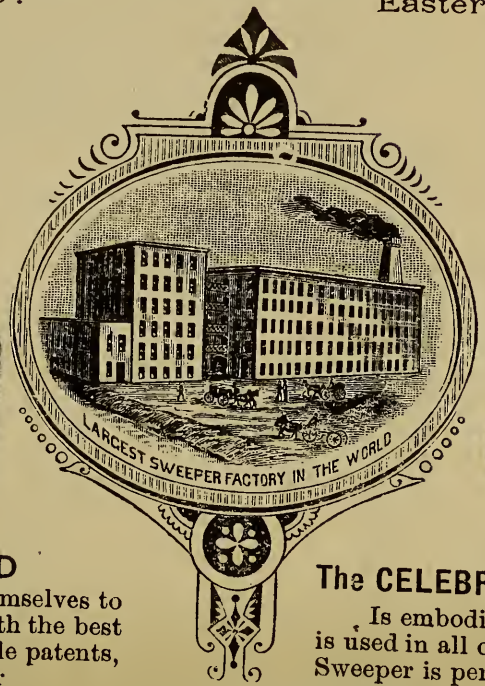
CARPET SWEEPERS ONLY.

Factory and General Office:
GRAND RAPIDS, MICH.

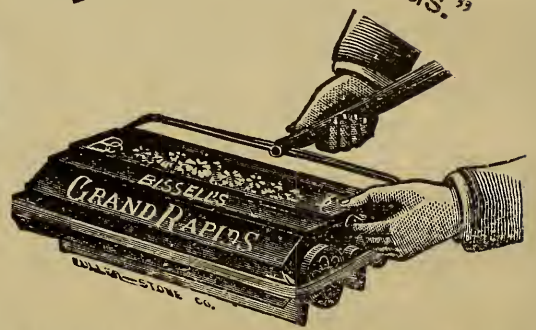
Eastern Branch and Export Office,
103 Chambers St., New York.

The Popular "Crown Jewel," No. 3.





The World Renowned
"Bissell Grand Rapids."



TIME HAS DEMONSTRATED

That only those dealers who have confined themselves to our line of CARPET SWEEPERS have met with the best results. Being the owners of over 50 valuable patents, we cover all the essential features necessary for

A Perfect-Working Sweeper.

The CELEBRATED BISSELL BROOM MOVEMENT

Is embodied in one of our most valuable patents and is used in all of our four-wheeled Sweepers. No Carpet Sweeper is perfect without this feature.

Send for our Descriptive Circulars which describe it in detail.

Every One is Guaranteed. Mechanical Construction and Finish Perfect. Latest Price-List Furnished on Application.

METRIC SYSTEM OF WEIGHTS AND MEASURES.

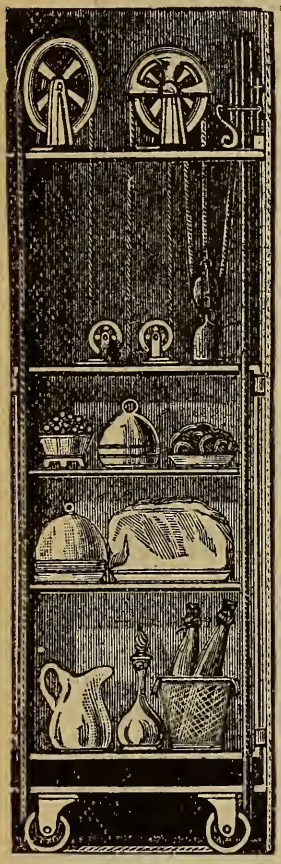
The metric system is based upon the distance from the equator to the pole. The ten-millionth part of this arc was chosen as the unit of measure of length, and called a *Metre*. The cube of the tenth part of the metre was adopted as the unit of capacity, and denominated a *Litre*. The weight of a litre of distilled water at its greatest density was called a *Kilogramme*, of which the thousandth part, or *Gramme*, was adopted as the unit of weight. The multiples of these, proceeding in decimal progression, are distinguished by the employment of the prefixes *deca*, *hecto*, *kilo* and *myria*, from the Greek, and the subdivisions by *deci*, *centi* and *milli*, from the Latin:

TABLE FOR THE CONVERSION OF METRIC WEIGHTS AND MEASURES INTO ENGLISH.

Metres into Yards.		Kilometres to Miles and Yards.			Litres into Gallons and Quarts.			Hectolitres into Quarts and Bushels.			Kilogrammes into Cwts. Qrs. Lbs. Oz.				Hectares into acres.	r.	p.
1	1·094	1	0	1094	1	0	0·880	1	0	2·751	1	0	0	2 3¼	1	2	1 35
2	2·187	2	1	427	2	0	1·761	2	0	5·502	2	0	0	4 6½	2	4	3 31
3	3·281	3	1	1521	3	0	2·641	3	1	0·254	3	0	0	6 9¾	3	7	1 26
4	4·374	4	2	855	4	0	3·521	4	1	3·005	4	0	0	8 13	4	9	3 22
5	5·468	5	3	188	5	1	0·402	5	1	5·756	5	0	0	11 0¼	5	12	1 17
6	6·562	6	3	1282	6	1	1·282	6	2	0·507	6	0	0	13 3½	6	14	3 12
7	7·655	7	4	615	7	1	2·163	7	2	3·258	7	0	0	15 7	7	17	1 8
8	8·749	8	4	1709	8	1	3·043	8	2	6·010	8	0	0	17 10¼	8	19	3 3
9	9·843	9	5	1043	9	1	3·923	9	3	0·761	9	0	0	19 13½	9	22	0 38
10	10·936	10	6	376	10	2	0·804	10	3	3·512	10	0	0	22 0¾	10	24	2 34
20	21·873	20	12	753	20	4	1·608	20	6	7·024	20	0	1	16 1½	20	49	1 28
30	32·809	30	18	1129	30	6	2·412	30	10	2·536	30	0	2	10 2¼	30	74	0 21
40	43·745	40	24	1805	40	8	3·215	40	13	6·048	40	0	3	4 3	40	98	3 15
50	54·682	50	31	122	50	11	0·019	50	17	1·560	50	0	3	26 3¾	50	123	2 9
60	65·618	60	37	498	60	13	0·823	60	20	5·072	60	1	0	20 4½	60	148	1 3
70	76·554	70	43	874	70	15	1.627	70	24	0·585	70	1	1	14 5¼	70	172	3 37
80	87·491	80	49	1251	80	17	2·431	80	27	4·097	80	1	2	8 6	80	197	2 38
90	98·427	90	55	1627	90	19	3·235	90	30	7·609	90	1	3	2 6½	90	222	1 24
100	109·363	100	62	243	100	22	0·039	100	34	3·121	100	1	3	24 7	100	247	0 18
200	218·727	200	124	487	200	44	0·077	200	68	6.242	200	3	3	20 15	200	494	0 37
300	328·090	300	186	730	300	66	0·116	300	103	1·362	300	5	3	17 6	300	741	1 15
400	437·453	400	248	973	400	88	0·155	400	137	4·483	400	7	3	13 14	400	988	1 33
500	546·816	500	310	1217	500	110	0·193	500	171	7·604	500	9	3	10 5	500	1235	2 11

NEW YORK SAFETY DUMB WAITER FIXTURES

Patented United States, April 19th, 1887; in Canada, May 18th, 1887.



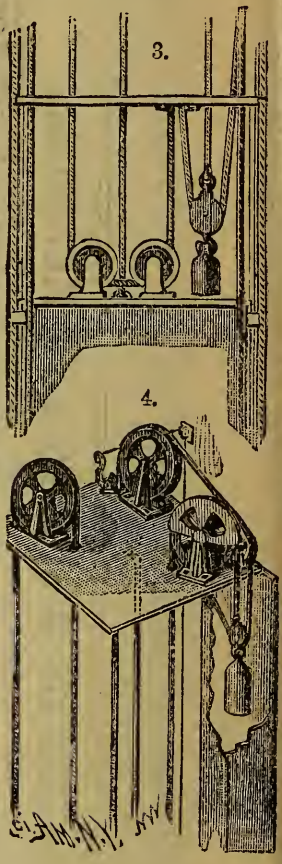
The MOST COMPLETE, SIMPLE and ABSOLUTELY SAFE WAITER made. Provided with SAFETY ROPE, AVOIDING ACCIDENT. ENTIRELY NOISELESS, and moves with perfect ease.

FIXTURES ONE SIZE ONLY, adapted to any size waiter. Can be adjusted by any CARPENTER or MECHANIC. DIAGRAM and FULL DIRECTIONS ACCOMPANY EACH SET.

HANDSOMELY BRONZED, and packed ONE SET in a BOX. Sold by the Hardware trade.

PRICE, 15.00.

For catalogue address the manufacturers.



We also make a Hand-Power Elevator (500lbs. Capacity).

Send for Descriptive Catalogue, also

Sheet of Testimonials.

THE EDWARD STORM SPRING CO., Limited, Poughkeepsie, N. Y.

or, JOHN H. GRAHAM & CO., Sole Mfrs. Agents, 113 Chambers Street, New York.

SPECIFIC GRAVITY AND WEIGHTS OF VARIOUS SUBSTANCES.

NAMES OF SUBSTANCES.	Average Weights. Per Cubic Ft.	Per Sq. Ft. 1 in. thick	Specific Gravity.
Anthracite, solid, of Pa	93		1.50
" broken, loose	54		
" " shaken	58		
" heaped bushel, loose.	(80 per	bushel,	heaped.)
Asphaltum	87	7.25	1.40
Brass, cast	504	42.	8.09
" rolled	524	43.7	8.4
Brick, best pressed	150		2.4
" common hard	125		2
" soft	100		1.6
Brickwork, pressed brick	140		2.25
" ordinary	112		1.8
Cement, Rosendale (loose)	56		
" Louisville "	50		
" Portland "	90		1.3
Coal, bituminous, solid	84		1.35
" " broken, loose	49		
" " " "	(74 per	bushel,	heaped.)
Coke, loose	27		
" heaped bushel, 38 lbs			
Copper, cast	542	45.2	8.7
" rolled	548	45.7	8.8
Earth, common dry, loose	76		
" " rammed	95		
" soft mud	108		
Glass	157	13.	2.53
Gneiss	168		2.7
Gold, cast, 24 karat	1204		19.3
" hammered, 24 karat	1217		19.6
Granite	170		2.73
Ice	58.7		0.95
Iron, cast	450	37.5	7.24
" wrought (hammered)	485	40.6	7.8
" " (rolled)	480	40.	7.7

NAMES OF SUBSTANCES.	Average Weights. Per Cubic Ft.	Per Sq. Ft. 1 in. thick	Specific Gravity.
Lead	711	59.25	11.4
Lime, loose quicklime	53		
" per bushel, 66 lbs			
Limestone and marble	168		2.7
Masonry, granite or limestone	165		
" rubble	154		
" dry	138		
" sandstone	144		
Mercury, at 32° F	849		13.6
Mortar, hardened	103	8.6	1.66
Mud, dry	80–110		
Petroleum	55		0.88
Quartz	165		2.65
Salt, Syracuse, coarse	45		
" fine Liverpool	49		
Sand, pure, dry, loose	90–106		
" shaken	99–117		
" perfectly wet	120–140		
Sandstone	151		2.43
Shales, red or black	162		2.6
Silver	655		10.5
Slate	175	14.6	2.8
Snow, fresh	5– 12		
" slush	15– 20		
Steel	490	$40\frac{5}{8}$	7.9
Sulphur	125		2.0
Tar	62		1.0
Tin	459		7.4
Turf or Peat, dry	20– 30		
Water, pure, at 60° F	$62\frac{1}{3}$		1.00
" sea	64		1.028
Zinc or Spelter, cast	446	37.1	7.15
" " rolled	448	37.3	7.19

NORTHAMPTON CUTLERY CO.,

New York Salesroom, 122 Chambers St., Only.
Office and Factory, Northampton, Mass.

MANUFACTURERS OF

SUPERIOR TABLE CUTLERY

Of Every Description,

With Cocoa, Ebony, Bone, Rubber, Celluloid, Ivory and Plated Handles, including an Assortment of

CARVERS AND PATENT GUARD FORKS

Of the latest and most approved designs.

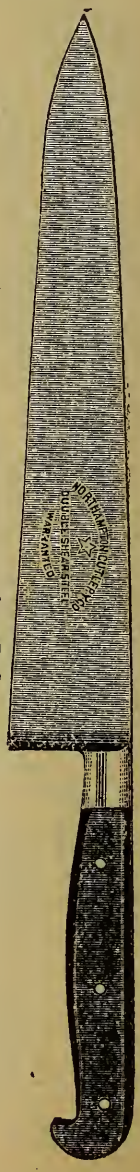
FRENCH COOKS' KNIVES

Tempered and ground especially for Professional use.

BUTCHER, HUNTING, STICKING AND SKINNING KNIVES,

In all the usual styles of perfect finish and guaranteed quality.

A full assortment of these very desirable Goods can be obtained from



ANY OF THE LEADING JOBBING HOUSES IN THE UNITED STATES.

ELECTRICAL CONDUCTIVITY OF METALS.

The most reliable tests of electric conductivity of the metals are those lately made by Mr. L. Weiller. They were conducted with a series of bars specially prepared for the purpose. The measurements were taken by means of a Wheatstone bridge with a sliding index, a differential galvanometer, and a battery of four cells. The results are given in the following table, the comparison being based on the conductivity of silver, which is taken as 100:

Names of Metals.	Conductivity.
Silver, pure	100
Copper, pure	100
Copper, pure, super-refined and crystallized	99.9
Silicon bronze, telegraphic	98
Copper and silver alloy at 50 per cent	86.65
Gold, pure	78
Silicon copper, 4 per cent. of silicon	75
Silicon copper, 12 per cent. of silicon	54.7
Aluminium, pure	54.2
Tin, with 10 per cent. of sodium	46.9
Silicon bronze, telephonic	35
Plumbiferous copper, with 10 per cent. of lead	30
Zinc, pure	29.9
Phosphor-bronze	29
Silicon brass, with 25 per cent of zinc	26.49
Brass, with 35 per cent of zinc	21.15
Phosphor-tin	17.7
Gold and silver, 50 per cent. each	16.12
Swedish iron	16
Banca tin, pure	15.45
Antimonous copper	12.7
Aluminium bronze, 10 per cent. Al	12.6
Cadmium Amalgam, 15 per cent. Cd	12.2
Siemens steel	12
Mercurial bronze	10.14
Platinum, pure	10.6
Arsenical copper, 10 per cent. arsenic	9.1
Lead, pure	8.88
Bronze, with 20 per cent. of tin	8.4
Nickel, pure	7.89
Phosphor-bronze, 10 per cent. tin	6.5
Phosphor-copper, 9 per cent. phosphorus	4.9
Antimony	3.88

Relative Non-Conductivity of Materials.

Mr Charles E. Emery of New York recently made some experiments upon relative non-conductivity, with reference to the needs of the New York Steam Company. His apparatus consisted of a boiler 12 feet in diameter, with three 10-inch flues passing through it. Inside these flues were smaller tubes, through which the steam passed. The non-conductors surrounded the inner tubes, and water was kept circulating around the flues in the outer shell. A layer of hair felt 2 inches thick gave the best result, and using equal thicknesses of the other materials the following percentage was obtained:

Hair felt	100	Loam	55
Mineral wool, No. 2	83.2	Gas-works lime, slaked	48
Mineral wool, No. 2 and tar	71.5	Asbestos	36.3
Sawdust	68	Coal ashes	34.5
Mineral wool, No. 1	67.6	Fuel coke	27.7
Charcoal	63.2	Air space, 2 inches deep	13.6
Pine wood, across grain	55.3		

The low result from air-space no doubt is due to the unimpeded circulation of the current.

Common Names of Chemical Substances.

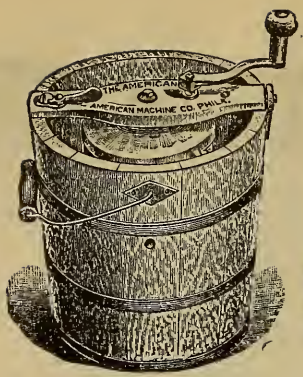
Common Names.	Chemical Names.
Aqua Fortis	Nitric Acid.
Aqua Regia	Nitro-Muriatic Acid.
Blue Vitriol	Sulphate of Copper.
Cream of Tartar	Bitartrate Potassium.
Calomel	Chloride of Mercury.
Chalk	Carbonate Calcium.
Salt of Tartar	Carbonate of Potassa.
Caustic Potassa	Hydrate Potassium.
Chloroform	Chloride of Gormyle.
Common Salt	Chloride of Sodium.
Copperas, or Green Vitriol	Sulphate of Iron.
Corrosive Sublimate	Bi-Chloride of Mercury.
Diamond	Pure Carbon.
Dry Alum	Sulphate Alluminum and Potassium.
Epsom Salts	Sulphate of Magnesia.
Ethiops Mineral	Black Sulphide of Mercury.
Fire Damp	Light Carburetted Hydrogen.
Galena	Sulphide of Lead.
Glauber's Salt	Sulphate of Sodium.
Glucose	Grape Sugar.
Goulard Water	Basic Acetate of Lead.
Iron Pyrites	Bi-Sulphide of Iron.
Jeweler's Putty	Oxide of Tin.
King's Yellow	Sulphide of Arsenic.
Laughing Gas	Protoxide of Nitrogen.
Lime	Oxide of Calcium.
Lunar Caustic	Nitrate of Silver.
Mosaic Gold	Bi-Sulphide of Tin.
Muriate of Lime	Chloride of Calcium.
Nitre of Saltpetre	Nitrate of Potash.
Oil of Vitriol	Sulphuric Acid.
Potash	Oxide of Potassium.
Realgar	Sulphide of Arsenic.
Red Lead	Oxide of Lead.
Rust of Iron	Oxide of Iron.
Salmoniac	Muriate of Ammonia.
Slacked Lime	Hydrate Calcium.
Soda	Oxide of Sodium.
Spirits of Hartshorn	Ammonia.
Spirit of Salt	Hydro-Chloric or Muriatic Acid.
Stucco, or Plaster of Paris	Sulphate of Lime.
Sugar of Lead	Acetate of Lead.
Verdigris	Basic Acetate of Copper.
Vermillion	Sulphide of Mercury.
Vinegar	Acetic Acid (Diluted).
Volatile Alkali	Ammonia.
Water	Oxide of Hydrogen
White Precipitate	Ammoniated Mercury.
White Vitriol	Sulphate of Zinc.

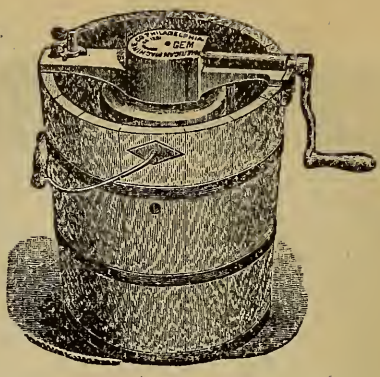
To Obtain the Weight of Grindstones.

Rule: Square the diameter (in inches), multiply by thickness (in inches), then multiply by decimal .06363.

Example: Find the weight of a stone 4 feet 6 inches diameter and 7 inches thick.

4 ft. 6 in.=54 inch; square of 54=2916; multiplied by 7=20412; multiplied by .06363=Ans., 1298.815 lbs., which is weight of stone. All Grindstones weighing *less* than 200 lbs. are sold at "cut-weight." This is the actual weight over the scales as they come from the lathe (less a fair amount for moisture), and is cut into each stone. All Grindstones weighing *over* 200 pounds are sold by measurement-weight only, rule for which is given.





"AMERICAN" SINGLE-ACTION

"GEM" DOUBLE-ACTION

ICE CREAM FREEZERS.

THE BEST IN THE WORLD.

Manufactured by

AMERICAN MACHINE COMPANY,

N. Cor. Lehigh Ave. & American Sts., PHILADELPHIA

Star Ice Chipper.

Send for Catalogue and "Some Reasons Why" the "Gem" is the best Freezer in the world.

Crown Ice Chipper.

JOSHUA BRITTON & SON,

STOUGHTON, MASS.,

Sole Manufacturers of

HENRY'S PAT. COMBINATION HAFT.

CUTS QUARTER SIZE.

The Advantages of this Haft over others are:

1st. It is the only Haft or Tool Holder that carries the tools in the same end of the Holder in which they are used.

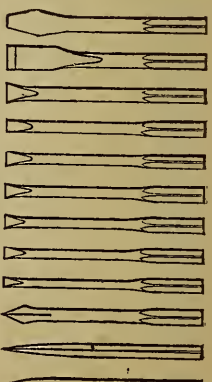
2d. No shifting the Holder end for end in changing the instrument.

3d. No shaking the tools out into the hand to get the one wanted.

4th. The same motion that unscrews the instrument in use removes the cap that covers the surplus tools

5th. No wrench to be used.

6th. It has a solid handle and can be used with a mallet.



The Hafts are furnished with a Nickel-Plated Brass Cap. The Handle is Rosewood.

THE TOOLS, FINE QUALITY STEEL PERFECTLY TEMPERED.

PRICE $6.50 PER DOZ. NET CASH.

SOME THINGS THAT ARE MISNAMED.

The misapplication of a name in speaking of the common things of life is a source of many errors, especially in the young. The reason why things are not rightly named in all cases is not because of any deficiency of our language, but because the names of most common substances were given long years ago, and very often before the true nature of the articles were understood. The "Journal of Applied Science" has this to say upon the subject:

Why should trade not have a Johnson to classify and correct the mass of inconsistencies that go to make up its nomenclature? We not only tax our brains to invent "fantastic" names for every new fabric, varied, perhaps, only by a thread or a shade from what our grandparents wore a century ago, but there are in use positive misnomers for many staple articles of merchandise. The following imperfect list, culled from sources already at hand, will give a faint idea of them:

Acid (sour), applied in chemistry to a class of bodies to which sourness is only accidental, and by no means a universal characteristic Thus rock crystals, quartz, flint, etc., are chemical acids, though no particle of acidity belongs to them.

Black lead does not contain a single particle of lead, being composed of carbon and iron.

Brazilian grass does not come from Brazil, or even grow there; nor is it grass at all. It consists of a palm leaf (Thrinax argentea), and is imported chiefly from Cuba.

Burgundy pitch is not pitch, nor is it manufactured in or exported from Burgundy. The best is a resinous substance prepared from common frankincense, and brought from Hamburg; but by far the greater quantity is a mixture of rosin and palm oil.

China, as a name for porcelain, gives rise to the contradictory expressions—British china, Dutch china, Chelsea china, etc., like wooden milestones, iron milestones, brass shoe-horns, iron pens, steel pens.

Cuttle bone is not bone at all, but a structure of pure chalk, once embedded loosely in the substance of certain species of cuttle fish. It is enclosed in a membraneous sac within the body of the fish, and drops out when the sac is opened, but it has no connection whatever with the sac of the cuttle fish.

Galvanized iron is not galvanized. It is simply iron coated with zinc; and this is done by dipping it in a zinc bath containing muriatic acid.

German silver is not silver at all, nor was the metallic alloy called by that name invented by a German, but has been in use in China time out of mind.

Honey soap contains no honey, nor is honey in any way employed in its manufacture. It is a mixture of palm oil, soap and olive-oil soap, each one part, with three parts of curd soap, or yellow soap scented.

Japan lacquer contains no lac at all, but is made from the sap of a tree called Rhus vernicifera.

Kid gloves are not usually made from kid skins, but of lamb or sheep skins. At present many of them are made of rat skins.

Meerschaum is not petrified "sea foam," as its name implies, but is a composition of silica, magnesia and water.

Mosaic gold has no connection with Moses or the metal gold. It is an alloy of copper and zinc, used in the ancient museum or tessellated work.

Mother-of-pearl is the inner layer of several sorts of shells. It is not the mother of pearl, as its name indicates, but in some cases the matrix of the pearl.

Pen means a feather (Latin penna, a wing). A steel pen is not a very choice expression.

Prussia blue does not come from Prussia, but is the precipitate of the salt of protoxide of iron with prussiate of potassa.

Salad oil is not oil for salad, but oil for cleaning sallades—i. e., helmets.

Salt is not salt at all, and has long been excluded from the class of bodies denominated "salts."

Sealing wax is not wax at all, nor does it contain a single particle of wax. It is made of shellac, Venice turpentine and cinnibar. Cinnibar gives it a deep, red color, and the turpentine renders the shellac soft and less brittle.

Sperm oil properly means "seed oil" (Latin, sperma, seed), from the notion that it was spermaceti (the sperm or melt of a whale). The sperm whale is the whale that gives "seed oil," which is taken chiefly, but not wholly from the head.

Whalebone is not bone at all, nor does it possess any of the properties of bone. It is a substance attached to the upper jaw of the whale, and serves to strain the water which the creature takes up in large mouthfuls.

Rhinoceros horn is not horn at all, but a kind of matted or compact hair, and is only like a horn from being a protuberance on the animal's head.

THE AUBURN TACK CO.,

AUBURN, N. Y.,

MANUFACTURERS OF

TACKS AND SMALL NAILS

OF EVERY DESCRIPTION.

STEEL CARPET TACKS,

UNIFORM "HORSE SHOE" BRAND,

TWO OUNCES In Paper. All Sizes.

DOUBLE UNIFORM "HORSE SHOE" BRAND,

FOUR OUNCES In Paper. All Sizes.

Basket Tacks and Nails a Specialty.

BARREL AND 3d FINE NAILS.

HUNGARIAN NAILS, OVAL AND SHOT HEAD.

Length and Number of Cut Nails to the Pound.

SIZE.	Length.	Common.	Clinch.	Fence.	Finishing.	Fine.	Barrel.	Casing.	Brads.	Tobacco.	Cut Spikes
¾.....	¾ in	.....	....	....	.....	.....	800	.....	.....	.....	....
⅛.....	⅛	.....	....	....	.....	.....	500	.....	.....	.....	....
2d.....	1	800	.. ..	....	1100	1000	376	.....	.....	.....	....
3d.....	1¼	480	....	....	720	760	224	.....	.....	.....	....
4d.....	1½	288	....	...	523	368	180	398	.....	.....	....
5d.....	1¾	200	..	. ..	410	.....	.....	.....	.....	130	...
6d.....	2	168	95	84	268	.....	.....	224	126	96	....
7d.....	2¼	124	74	64	188	.....	.....	.....	98	82	....
8d.....	2½	88	62	48	146	.....	.....	128	75	68	....
9d,.....	2¾	70	53	36	130	.....	.....	110	65	.....	....
10d.....	3	58	46	30	102	.....	.....	91	55	.....	28
12d.....	3¼	44	42	24	76	.....	.....	71	40	.....	....
16d.....	3½	34	38	20	62	.....	.....	54	27	.....	22
20d.....	4	23	33	16	54	.....	.....	40	.....	.....	14½
30d.....	4½	18	20	....	.....	.....	.....	33	.....	.....	12½
40d.....	5	14	....	....	.....	.....	.....	27	.....	.....	9½
50d.....	5½	10	....	....	.....	.....	.....	.....	.....	.....	8
60d.....	6	8	....	....	.....	.....	.....	.....	.....	.....	6
.....	6½	.....	....	....	.....	. ...	.....	.....	.....	.....	5½
.....	7	.....	....	....	.....	.....	.....	.....	.....	.....	4½
.....	8	.....	....	....	.....	.....	.....	.....	.....	.....	2½

NUMBER OF TACKS IN A POUND.

Title.	Length.	No. per lb.	Title.	Length.	No. per lb.
1 ounce.	$\frac{3}{16}$ inch.	16,000	10 ounce.	$\frac{12}{16}$ inch.	1,600
1½ ounce.	$\frac{7}{32}$ inch.	10,666	12 ounce.	$\frac{14}{16}$ inch.	1,332
2 ounce.	$\frac{1}{4}$ inch.	8,000	14 ounce.	$\frac{12}{16}$ inch.	1,143
2½ ounce.	$\frac{5}{16}$ inch.	6,400	16 ounce.	$\frac{13}{16}$ inch.	1,000
3 ounce.	$\frac{3}{8}$ inch.	5,332	18 ounce.	$\frac{14}{16}$ inch.	888
4 ounce.	$\frac{7}{16}$ inch.	4,000	20 ounce.	$\frac{15}{16}$ inch.	800
6 ounce.	$\frac{8}{16}$ inch.	2,666	22 ounce.	1 inch.	727
8 ounce.	$\frac{9}{16}$ inch.	2,000	24 ounce.	$1\frac{1}{8}$ inch.	666

STANDARD WIRE BRAD LIST.

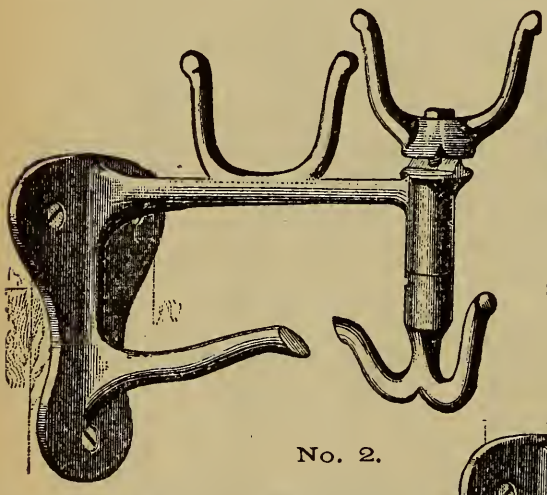
Length.	Gauge.			Length.	Gauge.		
Inch.	Fine.	Med.	Stout.	Inch.	Fine.	Med.	Stout.
⅜	21	20	19	1½	16	15	14
½	20	19	18	1¾	15	14	13
⅝	20	19	18	2	14	13	12
¾	19	18	17	2¼	14	13	12
⅞	18	17	16	2½	13	12	11
1	18	17	16	2¾	13	12	11
1¼	17	16	15	3	12	11	10

The Term "Penny" as Applied to Nails.

The origin of the terms "six-penny," "ten-penny," etc., as applied to nails, though not commonly known, is involved in no mystery whatever. Nails have been made a certain number of pounds to the thousand for many years, and are still reckoned in that way in England, a ten-penny being a thousand nails to ten pounds, a six-penny a thousand to six pounds, a twenty-penny weighing twenty pounds to the thousand; and, in ordering, buyers call for the three-pound, six-pound, or ten-pound variety, etc., until, by the Englishmen's abbreviation of "pun" for "pound," the abbreviation has been made to stand for penny, instead of pound, as originally intended.

CUT NAILS,
SPIKES
CLINCH NAILS,
BOILER and BRIDGE RIVETS,
BOILER BRACE JAWS, STAY BOLT IRON,
SQUARE AND HEXAGON NUTS,
WASHERS AND BOLTS.

FULLER BROTHERS & CO.,
139 GREENWICH ST., - - NEW YORK.

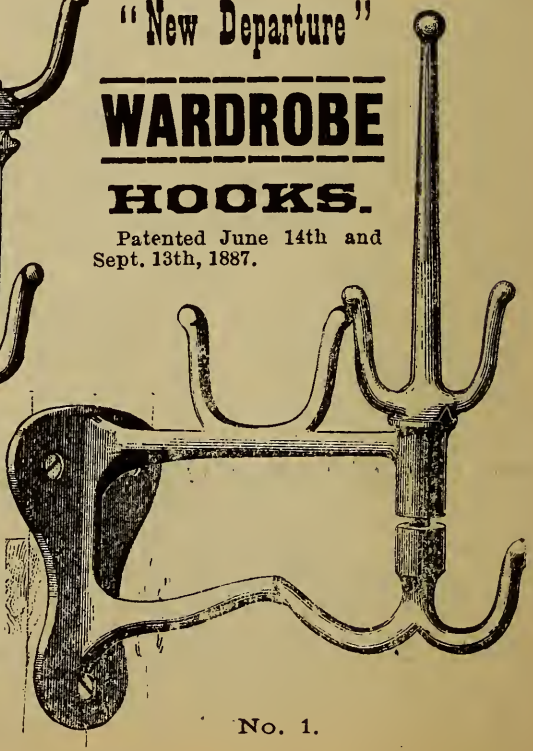


No. 2.

"New Departure"

WARDROBE HOOKS.

Patented June 14th and Sept. 13th, 1887.



No. 1.

One Hook Equal to a Whole Closet.

Six to ten garments can be placed on a hook and any one may be removed without taking off the others. By turning the swivelled hook, garments can be placed on the bottom stud, and the hook closed. To remove an inner garment, draw forward the loops of the outer garments on to the swivelled hook, and then open it right or left, and the desired one can be removed.

$3 Per Doz. Liberal Discounts.

JAYNE & CROSBY, 110 LIBERTY STREET, NEW YORK.

EXTRAS ON CUT NAILS.

At a meeting of the Nail Association held Feb. 9th, 1888, the following changes in the Schedule of Extras were unanimously adopted, to go into effect immediately, *viz.:*

The base to be 10d to 30d, No Extra.
40d, 50d and 60d to be 25 cents per Keg above base.
3d Fine to be $1.75 per Keg above base.
Clinch Nails to be $1 above same length common Nail.
Each Half-Keg to be 15 cents extra.

The above changes leave the Extras above base standing thus:
8d and 9d Nails, Fencing, Sheathing and Brads, 40d, 50d, 60d Nails and all Spikes 25 cents.
6d and 7d Nails, Fencing and Sheathing and Brads, 50 cents.
4d and 5d Nails, Fencing, Sheathing and Brads, 75 cents.
3d, 3½ and 4d Fine, $1.50; 3d Fine, $1.75; 2d, $2.25.
Cooper, Tobacco and Slating to be 50c. above same length common Nail.
Flooring, Casing and Box to be 75c. above same length common Nail.
Clinch Nails and Finishing to be $1 above same length common Nail.
Fine Finishing to be $1 25 above same length common Nail.
Each Half-Keg, 15 cents Extra.

Rules to be Observed in Ordering Metal or Wire.

In case parties ordering Metal or Wire have no Gauge, a small piece of either material may be sent, which will answer for the Number.
All Copper in Sheets is numbered according to Stubs' Gauge.
All Brass in Sheets is numbered according to Brown & Sharpe's Gauge.
Brass and Copper Wire is numbered according to Stubs' Gauge.
Brazed Brass and Copper Tubing is numbered according to Brown & Sharpe's Gauge.
Seamless Brass and Copper Tubing is numbered according to Stubs' Gauge.
All orders, when the name of Gauge is not stated, will be filled as above.
In ordering Metal always state width and temper wanted.
In ordering Wire always state whether Hard, Soft or Spring Wire is wanted.
The term "High" Brass refers to color, and not to temper.
For table of information relating to Weights and Sizes of Sheet Copper, see Contents
For table showing the difference between Gauges, see Contents.

Copper Rivets and Burs.

Copper Rivets and Burs are packed as follows:
Belt Rivets and Burs, an equal number of each in 1 lb. boxes.
Belt Rivets only, in 1 lb boxes
Belt and Hose Rivets only, no Burs, in 4 lb. boxes.
Oval Head Trunk Rivets only, no Burs, No. 9, in 4 lb. boxes.
Braziers' Rivets only, in 5 lb. boxes.
Burs only, in 1 lb. boxes.
Belt Rivets, assorted lengths, from ⅜ inch to ¾ inch, of one number, with Burs to match, in ½ lb. and 1 lb. boxes.

Sizes of Soldering Coppers.

Pointed, 1½ lbs. per pair.
" 2, 3, 4 5, 6, 7, 8, 9, 10, 12 lbs. per pair.
Flat, 3, 4, 5, 6, 7, 8 lbs. per pair.
Hatchet, 4, 5, 6, 7, 8, 9, 10 lbs. per pair.
Roofing, 11 lbs. per pair, with handles and shield.

CUT SPIKES.

NUMBER IN KEG OF 100 POUNDS.

3	inch	2900	5	inch	950	6½	inch	575
3½	"	2100	5½	"	850	7	"	450
4	"	1500	6	"	775	8	"	375
4½	"	1150						

RAILROAD SPIKES.

NUMBER IN 100 POUNDS.

Thickness.	Length.									
	3	4	5	6	7	8	9	10	12	14
¼	1340	1060	870	680						
5/16		620	580	540						
3/8			460	380	320	290	250			
7/16			320	280	240	220	200			
½			260	210	180	170	140	130	110	
5/8			170	130			100	90	80	70

WROUGHT BOAT AND SHIP SPIKES.

NUMBER IN A KEG OF 150 POUNDS.

Thickness.	Length.												
	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	10
¼	1910	1585	1326	1223	1025									
5/16	1010	963	810	605	583		521							
7/16			542	503	461	423	402	321						
½					340	312	298	280	261	240	223			
9/16							221	200	190	180	170	160	150	130
5/8											140	130	120	100

WEIGHT AND THICKNESS OF BOILER IRON.

1/8	inch weighs	5	lbs. per	sq. ft.
3/16	" "	7½	"	"
¼	" "	10	"	"
5/16	" "	12½	"	"
3/8	" "	15	"	"
7/16	" "	17½	"	"
½	" "	20	"	"

No. 1	Iron is	5/16	inch thick.
No. 3	"	9/32	"
No. 4	"	¼	"
No. 5	"	7/32	"
No. 7	"	3/16	"

TABLE

SHOWING AVERAGE WEIGHT PER FATHOM, ADMIRALTY TEST, AND SIZES OF CHAINS REQUIRED FOR VESSELS, ACCORDING TO THEIR REGISTERED TONNAGE. FOR LOW DECK VESSELS ADD ONE FIFTH TO THE TONNAGE.

Size.	Common Coil Weight in 100 feet.	Proved. Av'g Weight per Fathom.		Size of Rope.	Proof.		Ship's Tonnage.	Size of Anchor
Inches.		Stud.	Short Link.	Inches.	Cable Chain.	B B B Crane Chain.		
3-16	50	.....	4	1	.....	.....	.....	.....
¼	80	.....	6	1¾	1	1½	.....	.....
5-16	100	.....	7	2⅛	1½	2	.....	.....
⅜	140	.....	9	3¼	2	3	.....	.....
7-16	210	.....	12	4	3	4	.....	.....
½	265	.....	15	4¾	4	5	30	150
9-16	320	.....	19	5⅛	5	6	50	200
⅝	420	.....	25	6¼	6	8	75	300
11-16	500	.....	30	7	8	10	100	400
¾	590	33	35	7¾	10	12	100	500
13-16	680	38	40	8½	12	14	110	600
⅞	790	43	46	9¼	14	16	130	700
15-16	.....	50	54	10	16	18	160	800
1	.....	58	61	10¾	18	22	200	900
1 1-16	.....	65	69	11¼	20	26	240	1,000
1⅛	.....	72	76	12	23	28	280	1,300
1 3-16	.....	80	85	12¾	26	30	320	1,450
1¼	.....	89	95	13½	28	34	360	1,600
1 5-16	.....	98	104	14¼	30	37	400	1,750
1⅜	.....	110	115	15	34	41	440	1,900
1 7-16	.....	118	125	15½	37	44	500	2,100
1½	.....	128	135	16	41	48	550	2,300
1 9-16	.....	138	148	16½	44	52	600	2,500
1⅝	.....	150	160	17¼	48	66	700	2,700
1 11-16	.....	161	.....	18	52	.....	850	2,900
1¾	.....	175	.....	18½	56	.....	1,000	3,100
1 13-16	.....	188	.....	19¼	60	.....	1,150	3,300
1⅞	.....	200	.....	20	64	.....	1,300	3,500
1 15-16	.....	215	.....	21	68	.....	1,450	3,700
2	.....	230	.....	22	72	.....	1,600	3,900
2⅛	.....	250	.....	.....	80	.....	2,000	4,300
2¼	.....	290	.....	.....	88	.....	2,500	4,700

⅜ inch and smaller chains are made of full size iron; all other sizes exact. Tested to the English Admiralty Standard.

German Coil Chain.

Wire Gauge	5	6	7	8	9	10	11	12	13
Number	000	00	0	1	2	3	4	5	6
Weight in lbs. of 100 feet	37	30¼	24	19	14¾	11½	8¾	7	4¼
Breaking Strength	695	580	520	488	360	322			

THE STAR
Safety Razor.

This is the first Safety Razor and the only one that has given perfect satisfaction and is endorsed by many prominent men.

Patented:
June 15, 1880,
June 22, 1880,
May 4, 1886,
June 22, 1886,
June 22, 1886,
December 14, 1886,
March 8, 1887,
April 12, 1887.

KAMPFE BROS.
No. 8 Reade St.,
NEW YORK.

ELIZABETHPORT STEAM CORDAGE CO.

Manufacturers of

Manilla, Sisal and Hemp

CORDAGE.

TRADE MARK E **Binder Twine a Specialty.** TRADE MARK E

No. 46 South Street, New York.

APPROXIMATE WEIGHT and STRENGTH of CORDAGE.

Furnished by L. Waterbury & Co., New York City.

Circumference in inches.	Diameter in inches.	Weight of 100 fat'ms or 600 ft. in lbs.	Weight of 100 Fat'ms, Tarred in lbs.	Strength of New Ropes, in lbs.	No. of feet in 1 lb.
6 thd.	$\frac{3}{16}$ in.	12	17	540	50 feet,
9 "	$\frac{1}{4}$ "	18	24	780	33 " 4 in.
12 "	$\frac{5}{16}$ "	24	34	1000	25 "
15 "	$\frac{3}{8}$ "	30	45	1280	20 "
1¼ in.	$\frac{7}{16}$ "	37	50	1562	17 " 8 in.
1½ "	$\frac{1}{2}$ "	46	55	2250	13 "
1¾ "	$\frac{9}{16}$ "	65	85	3062	9 " 3 in.
2 "	$\frac{5}{8}$ "	80	100	4000	7 " 6 in.
2¼ "	$\frac{3}{4}$ "	98	125	5000	6 "
2½ "	$\frac{13}{16}$ "	120	155	6250	5 "
2¾ "	$\frac{7}{8}$ "	142	190	7500	4 " 3 in.
3 "	1 "	170	225	9000	3 " 6 in.
3¼ "	$1\frac{1}{16}$ "	200	265	10500	3 "
3½ "	$1\frac{1}{8}$ "	230	300	12250	2 " 7 in.
3¾ "	$1\frac{1}{4}$ "	271	350	14000	2 " 3 in.
4 "	$1\frac{5}{16}$ "	310	405	16000	1 " 11 in.
4¼ "	$1\frac{3}{8}$ "	346	455	18 62	1 " 8 in.
4½ "	$1\frac{1}{2}$ "	390	510	20250	1 " 6 in.
4¾ "	$1\frac{9}{16}$ "	435	575	22500	1 " 5 in.
5 "	$1\frac{5}{8}$ "	480	640	25000	1 " 3 in.
5½ "	$1\frac{3}{4}$ "	581	775	30250	1 "
6 "	2 "	678	930	36 00	10⅔ in.
6½ "	$2\frac{1}{8}$ "	797	1075	42250	9 in.
7 "	$2\frac{1}{4}$ "	920	1245	49000	7⅔ in.
7½ "	$2\frac{1}{2}$ "	1106	1405	56250	6½ in.
8 "	$2\frac{5}{8}$ "	1265	1600	64000	5½ in.
8½ "	$2\frac{7}{8}$ "	1420	1780	72250	5 in.
9 "	3 "	1572	2030	81000	4½ in.
9½ "	$3\frac{1}{8}$ "	1760	2285	90250	4 in.
10 "	$3\frac{3}{8}$ "	1951	2550	100000	3½ in.

The relative strength of Manila to Sisal is about as 7 is to 5; or Manila is about 25 per cent. stronger than Sisal. Hawser-laid Rope will weigh one-sixth less.

Number of Railroad Spikes Used to One Mile of Track.

Size measured under head.	Average No. per keg of 200 lbs.	Ties 2 feet between centers, 4 spikes per tie makes per mile.	Rail used, weight per yard.
$5\frac{1}{2}$ x $\frac{9}{16}$	375	5870 lbs=29½ kegs.	45 to 70
5 x $\frac{9}{16}$	400	5170 " =26 "	40 to 56
5 x $\frac{1}{2}$	450	4660 " =23⅓ "	35 to 40
$4\frac{1}{2}$ x $\frac{1}{2}$	530	3960 " =20 "	28 to 35
4 x $\frac{1}{2}$	600	3520 " =17⅔ "	24 to 35
$4\frac{1}{2}$ x $\frac{7}{16}$	680	3110 " =15½ "	20 to 30
4 x $\frac{7}{16}$	720	2910 " =14¾ "	
$3\frac{1}{2}$ x $\frac{7}{16}$	900	2350 " =11 "	16 to 25
4 x $\frac{3}{8}$	1000	2090 " =10½ "	
$3\frac{1}{2}$ x $\frac{3}{8}$	1190	1780 " = 9 "	16 to 20
3 x $\frac{3}{8}$	1240	1710 " = 8½ "	
$2\frac{1}{2}$ x $\frac{3}{8}$	1342	1575 " = 7⅔ "	12 to 16

SEE PAGE 119.

BOSLEY'S

Flexible Rubber Weather Strips

SOLID RUBBER—MOULDED INTO SHAPE.

ALL ONE PIECE. NO STITCHING. NO CEMENTING.

PATENT APPLIED FOR.

No. 8—Size $\frac{3}{8}$ in.

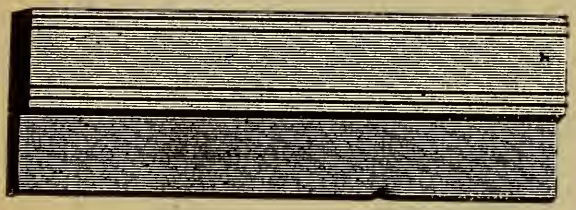
Price.....per foot, 5 cents

No. 8—For the Sides of Windows.

No. 9—Size $\frac{1}{2}$ in.

Price.....per foot, 6 cents.

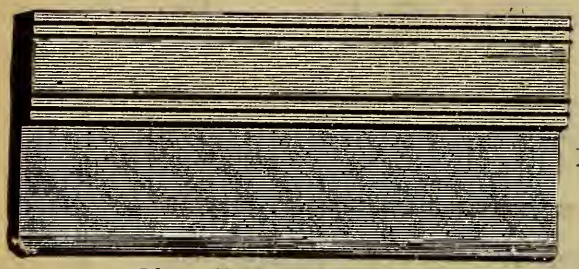
No. 9—For the Sides of Windows, and Sides and Tops of Doors.



No. 10—Size $\frac{3}{4}$ in.

Price.....per foot, 8 cents.

No. 10—For Sides and Tops of Doors, and the Bottom of Light Doors.



No. 11—Size 1 in.

Price.....per foot, 10 cents.

No. 11—For the Bottom of Heavy Doors.

These Flexible Weather Strips are put up in lengths of 50 feet, making a package about 6 or 8 inches wide—1000 feet making one foot square. Anyone can apply them, with tack-hammer and shears.

Liberal Discounts to the Trade.

MANUFACTURED ONLY BY

D. W. BOSLEY & CO.,

273 East Madison St., CHICAGO, ILL., U. S. A.

JOHN H. GRAHAM & CO., Sole Agents, 113 Chambers St., New York.

OVAL SLIDE VISES.

SIZES OF SCREWS AND LENGTH OF JAWS.

Nos	00	0	1	2	3	4
Sizes of Screws...inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$
Length of Jaws...inches	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$
Weight. pounds	$7\frac{3}{4}$	11	18	29	$36\frac{1}{2}$	54

SOLID BOX VISES.

LENGTH OF JAWS TO EACH SIZE MANUFACTURED.

Nos	25	30	35	40	45	50	55	60	65
Length of Jaws...inches	$3\frac{3}{8}$	$3\frac{1}{2}$	$3\frac{7}{8}$	4	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	$4\frac{3}{4}$

SOLID BOX VISES.—(CONTINUED.)

Nos	70	75	80	85	90	95	100	105	110
Lg'th of Jaws. inches	5	5	$5\frac{1}{4}$	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{3}{4}$	6	6	$6\frac{1}{4}$

SOLID BOX VISES.—(CONTINUED.)

Nos	115	120	125	130	135	140	145
Length of Jaws....inches	$6\frac{1}{4}$	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{3}{4}$	$6\frac{3}{4}$	7	7

SOLID BOX VISES.—(CONTINUED.)

Nos	150	160	170	180	190	200
Length of Jaws.....inches	7	$7\frac{1}{4}$	$7\frac{1}{4}$	8	8	8

BOXES AND SCREWS.

Diam. of Screw.									
$1\frac{1}{8}$	inch.	No.	1,	for	Vises	from	No.	30 to No.	50
$1\frac{1}{4}$	"	"	2,	"	"	"	"	55 to "	70
$1\frac{1}{4}$	"	"	3,	"	"	"	"	75 to "	85
$1\frac{1}{2}$	"	"	4,	"	"	"	"	90 to "	100
$1\frac{1}{2}$	"	"	5,	"	"	"	"	105 to "	125
$1\frac{3}{4}$	"	"	6,	"	"	"	"	130 to "	195
2	"	"	7,	"	"	"	"	200 to "	250

Rope and Iron-Strapped Tackle Blocks.

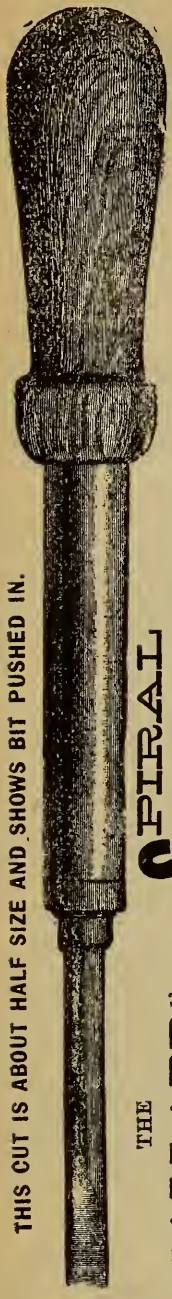
DIAMETER OF SHEAVES AND SIZE OF ROPE TAKEN BY EACH.

Lg'th of Blocks...inches	4	5	6	7	8	9	10	11	12
Diam. of Wheels..inches	$2\frac{1}{2}$	3	$3\frac{1}{2}$	$4\frac{1}{4}$	5	$5\frac{3}{4}$	$6\frac{1}{2}$	$7\frac{1}{4}$	8
Diam. of Rope....inches	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$

THICK MORTISE BLOCKS.

Length of Blocks.....inches	9	10	11	12	15
Diameter of Wheels.....inches	$5\frac{3}{4}$	$6\frac{1}{2}$	$7\frac{1}{4}$	8	
Diameter of Rope.....inches	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$	

The Greatest Labor-Saving Tool extant.
Saves its cost in a very short time.



THIS CUT IS ABOUT HALF SIZE AND SHOWS BIT PUSHED IN.

THE "ALLARD" PATENT ORIGINAL

SPIRAL SCREW DRIVER.

Best Quality of Material,
Superior Workmanship.

Blades are made of the finest Steel and tempered with great care.

Warranted throughout.

The Screw-Driver herewith represented is designed more especially for light and rapid work.

Machinists, Gun and Locksmiths, Cabinet-Makers, Coffin-Makers, Carriage-Makers,

and all other mechanics who have large numbers of screws to drive will find it a very convenient tool.

No tiresome turning of the hand and twisting of the wrist. Press forward, and the spiral turns the screws.

☞Be sure you get the original "Allard," and not an imitation.

PRICE LIST.

No. 1.—Brass Cylinder and Black Walnut Handle, retail, $2.25 each, net; $27.00 per doz. No. 2.—Nickeled Cylinder, Rosewood Handles, $2.50 each, net; $30.00 per doz. No. 3.—Brass Cylinder, Rosewood Handles, small size, $2.25 each, net; $27.00 per doz. No. 4.—Nickeled Cylinder, Rosewood Handles, small size, $2.50 each, net; $30.00 per doz. Trade discount, 25 per cent. Terms, 60 days, or 2 per cent. off for cash, 10 days, f. o. b. Factory or New York.

N. B.—May be ordered from your nearest Jobber in all the principal cities throughout the United States and Canada, who will supply you at above discount, thus saving freight charges. A sample by mail at above price.

Wallen's Patent "UNIQUE" SCREW-HOLDING SCREW-DRIVER.

SHOWING CLUTCH HOLDING SCREW.

The above cut illustrates the best SCREW-HOLDING DRIVER yet produced; everyone using screw-drivers has doubtless experienced great difficulty, in particular places, in holding screws until well started, and readily appreciates a tool of this kind. It is indispensable to use in corners, overhead, and in unhandy places, that cannot be reached with both or either hands. Blades made of the best steel, and carefully tempered. Handles fastened to the blades by a screw through the tang.

Length of Blade, 6 in. Length of Driver, 10 in. Sample by mail, 50 cents.

Price, $6 per Dozen.

Discount 25 per Cent.

Manufactured by

WALLEN & NESBITT.

Manufactured by F. A. HOWARD.

The ALFORD & BERKELE COMPANY, Sole Agents

P. O. Box 2002. 77 Chambers Street, New York.

FROM BROWN & SHARPE.

TABLE OF DECIMAL EQUIVALENTS.

of 8ths, 16ths, 32nds and 64ths of an Inch.

FOR USE IN CONNECTION WITH

MICROMETER CALIPER.

8ths.	32nds.	64ths.	64ths.
$\frac{1}{8}$ = .125	$\frac{1}{32}$ = .03125	$\frac{1}{64}$ = .015625	$\frac{33}{64}$ = .515625
$\frac{1}{4}$ = .250	$\frac{3}{32}$ = .09375	$\frac{3}{64}$ = .046875	$\frac{35}{64}$ = .546875
$\frac{3}{8}$ = .375	$\frac{5}{32}$ = .15625	$\frac{5}{64}$ = .078125	$\frac{37}{64}$ = .578125
$\frac{1}{2}$ = .500	$\frac{7}{32}$ = .21875	$\frac{7}{64}$ = .109375	$\frac{39}{64}$ = .609375
$\frac{5}{8}$ = .625	$\frac{9}{32}$ = .28125	$\frac{9}{64}$ = .140625	$\frac{41}{64}$ = .640625
$\frac{3}{4}$ = .750	$\frac{11}{32}$ = .34375	$\frac{11}{64}$ = .171875	$\frac{43}{64}$ = .671875
$\frac{7}{8}$ = .875	$\frac{13}{32}$ = .40625	$\frac{13}{64}$ = .203125	$\frac{45}{64}$ = .703125
16ths.	$\frac{15}{32}$ = .46875	$\frac{15}{64}$ = .234375	$\frac{47}{64}$ = .734375
$\frac{1}{16}$ = .0625	$\frac{17}{32}$ = .53125	$\frac{17}{64}$ = .265625	$\frac{49}{64}$ = .765625
$\frac{3}{16}$ = .1875	$\frac{19}{32}$ = .59375	$\frac{19}{64}$ = .296875	$\frac{51}{64}$ = .796875
$\frac{5}{16}$ = .3125	$\frac{21}{32}$ = .65625	$\frac{21}{64}$ = .328125	$\frac{53}{64}$ = .828125
$\frac{7}{16}$ = .4375	$\frac{23}{32}$ = .71875	$\frac{23}{64}$ = .359375	$\frac{55}{64}$ = .859375
$\frac{9}{16}$ = .5625	$\frac{25}{32}$ = .78125	$\frac{25}{64}$ = .390625	$\frac{57}{64}$ = .890625
$\frac{11}{16}$ = .6875	$\frac{27}{32}$ = .84375	$\frac{27}{64}$ = .421875	$\frac{59}{64}$ = .921875
$\frac{13}{16}$ = .8125	$\frac{29}{32}$ = .90625	$\frac{29}{64}$ = .453125	$\frac{61}{64}$ = .953125
$\frac{15}{16}$ = .9375	$\frac{31}{32}$ = .96875	$\frac{31}{64}$ = .484375	$\frac{63}{64}$ = .984375

TABLE OF DECIMAL EQUIVALENTS

OF MILLIMETERS AND FRACTIONS OF MILLIMETERS,

FOR USE IN CONNECTION WITH

METRIC MICROMETER CALIPER.

mm.	Inches.	mm.	Inches.	mm.	Inches.	mm.	Inches.
$\frac{1}{50}$	= .00079	$\frac{20}{50}$	= .01575	$\frac{39}{50}$	= .03071	9	= .35433
$\frac{2}{50}$	= .00157	$\frac{21}{50}$	= .01654	$\frac{40}{50}$	= .03150	10	= .39370
$\frac{3}{50}$	= .00236	$\frac{22}{50}$	= .01732	$\frac{41}{50}$	= .03228	11	= .43307
$\frac{4}{50}$	= .00315	$\frac{23}{50}$	= .01811	$\frac{42}{50}$	= .03307	12	= .47244
$\frac{5}{50}$	= .00394	$\frac{24}{50}$	= .01890	$\frac{43}{50}$	= .03386	13	= .51181
$\frac{6}{50}$	= .00472	$\frac{25}{50}$	= .01969	$\frac{44}{50}$	= .03465	14	= .55118
$\frac{7}{50}$	= .00551	$\frac{26}{50}$	= .02047	$\frac{45}{50}$	= .03543	15	= .59055
$\frac{8}{50}$	= .00630	$\frac{27}{50}$	= .02126	$\frac{46}{50}$	= .03622	16	= .62992
$\frac{9}{50}$	= .00709	$\frac{28}{50}$	= .02205	$\frac{47}{50}$	= .03701	17	= .66929
$\frac{10}{50}$	= .00787	$\frac{29}{50}$	= .02283	$\frac{48}{50}$	= .03780	18	= .70866
$\frac{11}{50}$	= .00866	$\frac{30}{50}$	= .02362	$\frac{49}{50}$	= .03858	19	= .74803
$\frac{12}{50}$	= .00945	$\frac{31}{50}$	= .02441	1	= .03937	20	= .78740
$\frac{13}{50}$	= .01024	$\frac{32}{50}$	= .02520	2	= .07874	21	= .82677
$\frac{14}{50}$	= .01102	$\frac{33}{50}$	= .02598	3	= .11811	22	= .86614
$\frac{15}{50}$	= .01181	$\frac{34}{50}$	= .02677	4	= .15748	23	= .90551
$\frac{16}{50}$	= .01260	$\frac{35}{50}$	= .02756	5	= .19685	24	= .94488
$\frac{17}{50}$	= .01339	$\frac{36}{50}$	= .02835	6	= .23622	25	= .98425
$\frac{18}{50}$	= .01417	$\frac{37}{50}$	= .02913	7	= .27559	26	= 1.02362
$\frac{19}{50}$	= .01496	$\frac{38}{50}$	= .02992	8	= .31496		

10 mm. = 1 Centimeter = 0.3937 inches.
10 cm. = 1 Decimeter = 3.937 "
10 dm. = 1 Meter = 39.37 "
25.4 mm. = 1 English Inch.

SPECIAL NOTICE TO THE TRADE.

EUREKA FIRE HOSE COMPANY,

13 Barclay Street, New York.

MANUFACTURERS OF

Seamless Cotton and Mildew-Proof, Rubber Lined

"EUREKA GARDEN HOSE"

This Company for the season's trade in **Garden Hose** invites the especial attention of dealers, and solicits their orders for our products of Hose for Household purposes. This Hose is known as the **Eureka Garden Hose,** which we have greatly improved in appearance and weaving—unequalled by any and the very best Hose in the market.

EUREKA GARDEN HOSE SELLS ON SIGHT.

It is superior to the best Rubber Hose for durability and strength. It is Mildew-Proof and will stand over 500 lbs. pressure per square inch and outlasts Rubber-Hose many times over.

EXPOSE IT TO DRY AFTER USE,

thrugh it may be soaked every time it is used; having no outside covering to imprison the moisture, will, if given a fair chance, dry immediately, no gas is generated and the cotton is uninjured. This is a proven fact in fire departments, where our rubber-lined Cotton-Hose has been known to outlast all others many years. After use do not reel up wet, but put this Hose in the sun where it can dry and it will last many years. Once handled by the trade and used by the consumer, it has given the highest satisfaction to both parties.

THE EUREKA GARDEN HOSE

cannot be injured by exposure to sun, same as Rubber Hose.

PRICE LIST:

½ Inch Eureka Garden Hose.....20 Cents per Foot.
¾ " " " " .....25 " " "
1 " " " " .....35 " " "

SEND FOR SAMPLES.

Subject to Liberal Discount to the Trade. Couplings attached and Pipes Furnished when Required.

SPECIAL NOTICE:

For tho past ten years we have had this brand of Hose in the market, which has proven a Great Success, **Millions of Feet Being Sold.**

The Success of the Eureka Fire Hose Company's Garden Hose is due to the fact of the excellence of the material used in the manufacture, and also to its being treated mildew-proof, which is of vital importance to the success and durability of Cotton-Hose.

The Insure getting a Perfect Garden Hose, see that each length bears the brand of

Eureka Garden Hose.

Respectfully, **EUREKA FIRE HOSE CO.**

PERKINS HORSE SHOES.

Weight expressed in ounces.

Front Shoes, No.	0	1	2	3	4	5	6	7	8
Light	13	15	17	21	24	29	35		
Medium		17	20	24	28	34	38		
Heavy		19	22	27	32	36	41	49	54
Hind Shoes, No.	0	1	2	3	4	5	6	7	8
Light	10	12	15	18	22	26	31		
Medium		14	16	20	24	28	33		
Heavy		14	17	21	25	30	34	38	43
Mule, No.	1	2	3	4	5	6	7		
Front Shoes	10	12	15	18	22	25	29		

"Ausable" Horse Shoe Nails.

STANDARD SIZES.

No.	4	5	6	7	8	9	10	12
Length in inches.	$1\frac{5}{8}$	$1\frac{15}{16}$	$2\frac{1}{32}$	$2\frac{1}{4}$	$2\frac{7}{16}$	$2\frac{9}{16}$	$2\frac{11}{16}$	$3\frac{1}{16}$
Number in pound	276	168	138	110	96	80	73	57

WEIGHT OF IRON TIRE.—Per Set of 54 feet.

Size.	Lbs.	Size.	Lbs.	Size.	Lbs.
1 x $\frac{3}{16}$	34	$1\frac{1}{4}$ x $\frac{1}{4}$	56	$1\frac{1}{2}$ x $\frac{5}{8}$	169
1 x $\frac{1}{4}$	45	$1\frac{1}{4}$ x $\frac{5}{16}$	70	$1\frac{5}{8}$ x $\frac{1}{2}$	148
1 x $\frac{5}{16}$	56	$1\frac{1}{4}$ x $\frac{3}{8}$	85	$1\frac{5}{8}$ x $\frac{5}{8}$	183
1 x $\frac{3}{8}$	68	$1\frac{1}{4}$ x $\frac{7}{16}$	99	$1\frac{3}{4}$ x $\frac{1}{2}$	158
$1\frac{1}{8}$ x $\frac{1}{4}$	50	$1\frac{1}{4}$ x $\frac{1}{2}$	113	$1\frac{3}{4}$ x $\frac{5}{8}$	197
$1\frac{1}{8}$ x $\frac{5}{16}$	63	$1\frac{3}{8}$ x $\frac{3}{8}$	93	$1\frac{3}{4}$ x $\frac{3}{4}$	236
$1\frac{1}{8}$ x $\frac{3}{8}$	75	$1\frac{3}{8}$ x $\frac{1}{2}$	124	2 x $\frac{1}{2}$	180
$1\frac{1}{8}$ x $\frac{7}{16}$	88	$1\frac{1}{2}$ x $\frac{3}{8}$	101	2 x $\frac{5}{8}$	225
$1\frac{1}{8}$ x $\frac{1}{2}$	101	$1\frac{1}{2}$ x $\frac{1}{2}$	135	2 x $\frac{3}{4}$	270

WEIGHT OF STEEL TIRE.—Per Set of 54 feet.

Size.	Lbs.	Size.	Lbs.	Size.	Lbs.	Size.	Lbs.	Size.	Lbs.
$\frac{5}{8}$ x $\frac{1}{16}$	$7\frac{1}{2}$	$\frac{5}{8}$ x $\frac{3}{32}$	$11\frac{1}{2}$	$\frac{5}{8}$ x $\frac{1}{8}$	$15\frac{1}{4}$	$\frac{5}{8}$ x $\frac{3}{16}$	$22\frac{3}{4}$	$\frac{7}{8}$ x $\frac{7}{32}$	$35\frac{1}{2}$
$\frac{3}{4}$ x $\frac{3}{32}$	$13\frac{1}{4}$	$\frac{3}{4}$ x $\frac{1}{8}$	18	$\frac{3}{4}$ x $\frac{5}{32}$	22	$\frac{3}{4}$ x $\frac{3}{16}$	27	$\frac{3}{4}$ x $\frac{1}{4}$	$35\frac{1}{2}$
$\frac{7}{8}$ x $\frac{3}{32}$	$15\frac{1}{4}$	$\frac{7}{8}$ x $\frac{1}{8}$	$20\frac{1}{4}$	$\frac{7}{8}$ x $\frac{5}{32}$	25	$\frac{7}{8}$ x $\frac{3}{16}$	$30\frac{1}{2}$	$\frac{7}{8}$ x $\frac{1}{4}$	$40\frac{1}{2}$
1 x $\frac{1}{8}$	$23\frac{3}{4}$	1 x $\frac{5}{32}$	$29\frac{1}{2}$	1 x $\frac{3}{16}$	$35\frac{1}{2}$	1 x $\frac{7}{32}$	$42\frac{1}{4}$	1 x $\frac{1}{4}$	$47\frac{1}{2}$
1 x $\frac{5}{16}$	$58\frac{1}{2}$	$1\frac{1}{8}$ x $\frac{3}{16}$	$40\frac{1}{2}$	$1\frac{1}{8}$ x $\frac{1}{4}$	54	$1\frac{1}{8}$ x $\frac{5}{16}$	$67\frac{1}{2}$	$1\frac{1}{8}$ x $\frac{3}{8}$	81
$1\frac{1}{4}$ x $\frac{1}{4}$	59	$1\frac{1}{4}$ x $\frac{5}{16}$	74	$1\frac{1}{4}$ x $\frac{3}{8}$	$88\frac{1}{2}$	$1\frac{3}{8}$ x $\frac{3}{8}$	98	$1\frac{1}{2}$ x $\frac{3}{8}$	107
$1\frac{1}{2}$ x $\frac{7}{16}$	124	$1\frac{1}{2}$ x $\frac{1}{2}$	142	$1\frac{5}{8}$ x $\frac{1}{2}$	154	$1\frac{3}{4}$ x $\frac{1}{2}$	165	2 x $\frac{1}{2}$	190

Have a clean fire, and weld with equal parts of Borax, Salt and Sand.

RICHARDSON'S CELEBRATED SAWS

Are Unequalled for Quality, Temper and Workmanship. Taper Ground, Thin at Back, and Perfectly True,
AND HAVE JUSTLY ATTAINED AN ENVIABLE REPUTATION.

WE MAKE A FULL LINE OF

HAND, PANEL, RIP, BACK,
COMPASS, BUTCHERS', CIRCULAR, MILL, and

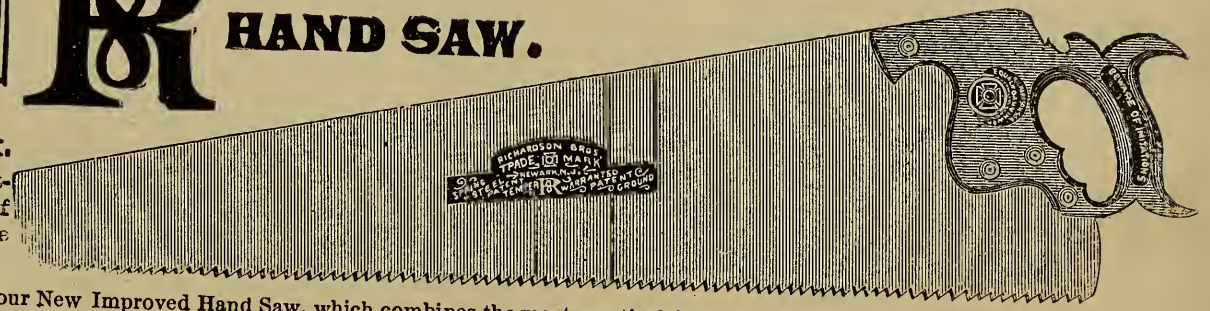
CROSS CUT SAWS.

Illustrated Catalogue sent on application.

Richardson's Trade Mark.

A Maltese Cross, with the letters BEST, emblematical of the standing of the Saws in the Trade.

R&R HAND SAW.



We give an illustration of our New Improved Hand Saw, which combines the most practical improvement yet offered on Saws.
The position of the handle brings the blade or heel of the Saw nearer the hand, which makes it hang much lighter, and additional Rivet, makes it the strongest and best Hand Saw in the market. We make this Saw in all lengths, and style it our R&R together with the $1.00 to List on regular No. 8. For price add

SPECIAL SAWS, OR ANY SAWS NOT ON OUR LIST, MADE TO ORDER.

Richardson's Saw Works, 15 to 27 River St., Newark, N.J., U.S.A.

Standard Sizes of Circular Saw Mandrels.

No.	Diameter of Pulley.	Face of Pulley.	Diameter of Flange.	Length of Shaft.	Diameter of Shaft.	Size of Hole in Saw.
1	2½ ins.	3½ ins.	2½ ins.	14 ins.	1 1-16 in	1 in.
2	3 "	4 "	3 "	16 "	1 3 16 "	1⅛ "
3	3½ "	4½ "	3½ "	18 "	1 5-16 "	1¼ "
4	4 "	5 "	4 "	20 "	1 7-16 "	1 5-16 "
5	4½ "	5½ "	4½ "	22 "	1 7-16 "	1 5-16 "
6	5 "	6 "	5 "	24 "	1 7-16 "	1⅜ "
7	5½ "	6½ "	5½ "	26 "	1 7-16 "	1⅜ "
8	6 "	7 "	6 "	28 "	1 9-16 "	1½ "
9	7 "	8 "	6 "	32 "	1 11-16 "	1⅝ "
10	8 "	8 "	6 "	36 "	1 13-16 "	1¾ "

When Ordering Circular Saws,

The following directions should be explicitly given:

Diameter of Saw in inches.
Thickness (or Gauge) of Saw at Rim.
Thickness (or Gauge) of Saw at Centre.
Log side, right or left hand, saw *cutting towards you.*
Number of Teeth in Saw.
Kind and number of Tooth.
Size of mandrel hole.
Size of pin hole.
Distance between pin holes from centre to centre.

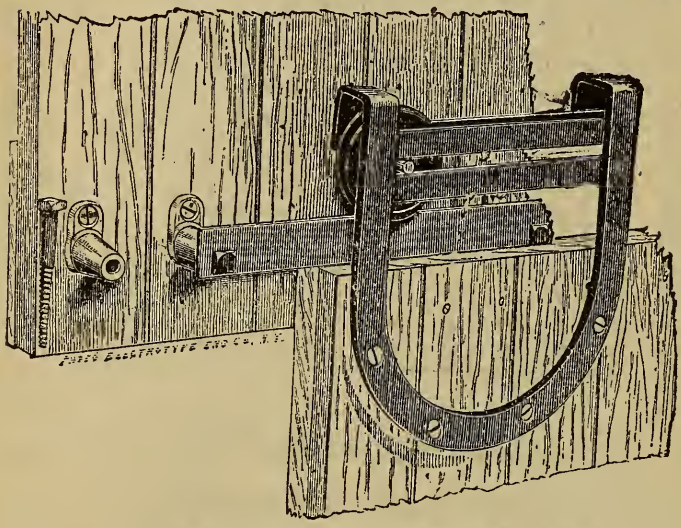
Standard Gauges for Circular and Mill Saws.

Gauge.			
No. 4.....	¼	inch,	scant.
" 5.....	7-32	"	
" 6.....	3-16	"	full.
" 7.....	3-16	"	scant.
" 8.....	5-32	"	
" 9.....	5-32	"	scant.
" 10.....	⅛	"	full.

Gauge.			
No. 11.....	⅛	inch,	scant.
" 12.....	3-32	"	full.
" 13.....	3-32	"	scant.
" 14.....	5-64	"	full.
" 15.....	5-64	"	scant.
" 16.....	1-16	"	full.

LANE'S
PATENT STEEL DOOR HANGER.

The most perfect Anti-Friction Hanger in the Market,



BECAUSE

It is made of steel throughout, except the wheel, which has a steel axle, It will not break It is practically free from wear, It is almost noiseless in action. It requires no oil. It has a broad bearing on the door and keeps in line. It is by far the most durable. It may be used with any track. It is always in order.

LANE'S PATENT TRACK

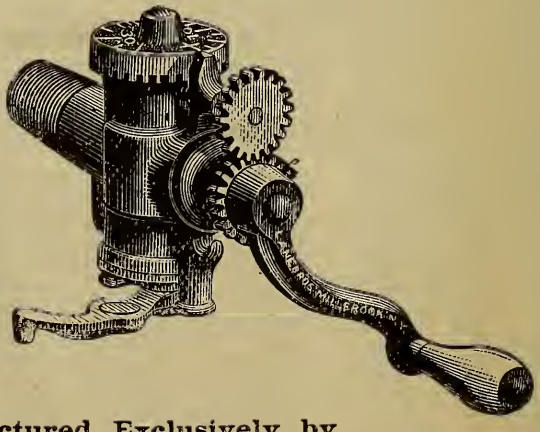
Is made of steel and is easily put in position. Catches and holds no snow or ice. Door hung thereon cannot jump the track. Is not subject to decay. Requires no fitting, but is ready at once. May be used with hangers of other manufacture.

LANE'S MEASURING FAUCET.

PRICE, $3.00.

For Light or Heavy Molasses, Oils, Varnishes or other Fluids.

We warrant these Faucets to to be as represented, measuring correctly and working more easily in heavy molasses than any Measuring Faucet in the market. No grocer can afford to be without them, for they save time, and "time is money." They insure perfect cleanliness, requiring no tin measures or funnel to collect dirt and draw flies. They do not drip. They prevent all waste, as no molasses or other fluid can pass except when the crank is turned. They are the embodiment of simplicity, and consequently they are always in order. They work easily in the heaviest molasses. They are warranted to measure correctly, according to U. S. Standard.



Manufactured Exclusively by

LANE BROS., Poughkeepsie, N. Y.

GENERAL AGENCY,

JOHN H. GRAHAM & CO., 113 Chambers St., New York.

Standard Length of Cut of Hatchets and Bench Axes.

Nos.	1	2	3
Shingling	3½	3⅞	4⅜ inches.
Claw	3½	3⅞	4⅜ inches.
Half	3½	3⅞	4⅜ inches.
Lath	2½	2¾	3 inches.

No.	1	2	3	4	5	6	7	8	9
Bench	3¾	4½	5	5½	6	6¾	7½	8¼	9 inches.

Weights of Washoe (Adz Eye) Picks.

RAILROAD PICKS.

Nos.	1	2	3	4	5	6	7	8
Weight	5	5½	6	6½	7	7½	8	8½ lbs.

MINING OR DRIFTING PICKS.

Nos	1	2	3	4	5	6	7	8	9
Weight	3	3½	4	4½	5	5½	6	6½	7 lbs.

POLL PICKS.

Nos	1	2	3	4	5	6	7	8	9
Weight	3½	4	4½	5	5½	6	6½	7	7½ lbs.

COAL PICKS.

Nos	1	2	3	4	5	6
Weight	3½	4	4½	5	6	6½ lbs.

Coes' (Genuine) Wrenches.

WILL TAKE NUTS OF THE FOLLOWING SIZES:

Size of Wrench	4	6	8	10	12	15	18	21 in.
Size of Nuts	½	⅞	1¼	1¾	2⅛	2⅝	3	4⅛ in.

Cast Steel Crowbars.

Size ....Inches	¾	⅞	1	1⅛	1¼	1⅜	1½
Usual Weight....Lbs.	6	8	10	13	17	22	26
Usual Length....Inches	44	48	52	55	58	66	72

"WESTERN" FILES,

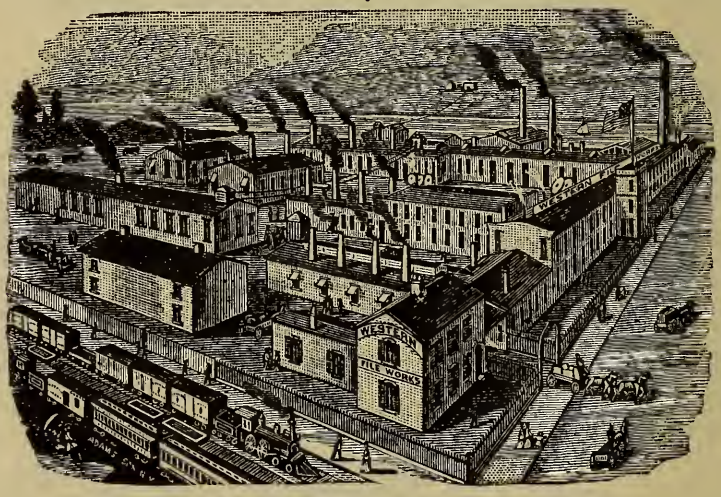
BEST CAST STEEL FILES,

WARRANTED TO BE UNEQUALLED IN THE MARKET,

FOR SALE BY

Iron and Hardware Dealers

THROUGHOUT THE UNITED STATES AND CANADA.



All Descriptions of Files

MADE TO ORDER.

WESTERN FILE CO., Limited.

BEAVER FALLS,

PENNSYLVANIA.

REGULAR STANDARD SIZES OF FILES.

[Expressed as nearly as possible without the use of Decimals.]

Length.	Mill-Saw Files.	Flat.	Hand.	Half Round.	Round and Square.	Cabinet Files.	Regular Taper Files.	Slim Taper Files.	Pit Saw Files.	Warding Files.
3 in.	$\frac{1}{32}\times\frac{1}{16}$ in.	$\frac{5}{16}\times\frac{5}{64}$ in.	$\frac{7}{16}\times\frac{3}{32}$ in.	$\frac{5}{16}\times\frac{3}{32}$ in.	$\frac{1}{8}$ in.		$\frac{1}{4}$ in.	$\frac{3}{16}$ in.	$\frac{1}{4}\times\frac{1}{8}$ in.	$\frac{3}{8}\times\frac{3}{64}$ in.
$3\frac{1}{2}$ in.							$\frac{9}{32}$ in.	$\frac{7}{32}$ in.	$\frac{9}{32}\times\frac{9}{64}$ in.	$\frac{7}{16}\times\frac{3}{64}$ in.
4 in.	$\frac{7}{16}\times\frac{5}{64}$ in.	$\frac{7}{16}\times\frac{3}{32}$ in.	$\frac{1}{2}\times\frac{1}{8}$ in.	$\frac{7}{16}\times\frac{1}{8}$ in.	$\frac{5}{32}$ in.		$\frac{3}{8}$ in.	$\frac{1}{4}$ in.	$\frac{5}{16}\times\frac{5}{32}$ in.	$\frac{5}{32}\times\frac{1}{16}$ in.
$4\frac{1}{2}$ in.							$\frac{13}{32}$ in.	$\frac{9}{32}$ in.	$\frac{11}{32}\times\frac{11}{64}$ in.	$\frac{1}{2}\times\frac{1}{16}$ in.
5 in.	$\frac{1}{2}\times\frac{3}{32}$ in.	$\frac{1}{2}\times\frac{1}{8}$ in.	$\frac{5}{8}\times\frac{5}{32}$ in.	$\frac{1}{2}\times\frac{5}{32}$ in.	$\frac{3}{16}$ in.		$\frac{7}{16}$ in.	$\frac{9}{32}$ in.	$\frac{3}{8}\times\frac{3}{16}$ in.	$\frac{17}{32}\times\frac{5}{64}$ in.
$5\frac{1}{2}$ in.							$\frac{15}{32}$ in.	$\frac{11}{32}$ in.		$\frac{19}{32}\times\frac{5}{64}$ in.
6 in.	$\frac{5}{8}\times\frac{1}{8}$ in. scant.	$\frac{5}{8}\times\frac{5}{32}$ in.	$\frac{3}{4}\times\frac{3}{16}$ in.	$\frac{5}{8}\times\frac{3}{16}$ in.	$\frac{7}{32}$ in.	$\frac{11}{16}\times\frac{9}{64}$ in.	$\frac{1}{2}$ in.	$\frac{3}{8}$ in.	$\frac{7}{16}\times\frac{7}{32}$ in.	$\frac{5}{8}\times\frac{3}{32}$ in.
7 in.	$\frac{3}{4}\times\frac{1}{8}$ in. full.	$\frac{3}{4}\times\frac{3}{16}$ in.	$\frac{13}{16}\times\frac{13}{64}$ in.	$\frac{3}{4}\times\frac{13}{64}$ in.	$\frac{1}{4}$ in.	$\frac{13}{16}\times\frac{5}{32}$ in.	$\frac{9}{16}$ in.	$\frac{7}{16}$ in.	$\frac{1}{2}\times\frac{1}{4}$ in.	
8 in.	$\frac{13}{16}\times\frac{5}{32}$ in.	$\frac{13}{16}\times\frac{13}{64}$ in.	$\frac{7}{8}\times\frac{7}{32}$ in.	$\frac{13}{16}\times\frac{15}{64}$ in.	$\frac{9}{32}$ in.	$\frac{7}{8}\times\frac{11}{64}$ in.	$\frac{5}{8}$ in.	$\frac{1}{2}$ in.	$\frac{9}{16}\times\frac{9}{32}$ in.	
9 in.	$\frac{7}{8}\times\frac{11}{64}$ in.	$\frac{7}{8}\times\frac{7}{32}$ in.	1 $\times\frac{1}{4}$ in.	$\frac{7}{8}\times\frac{1}{4}$ in.	$\frac{5}{16}$ in.	1 $\times\frac{3}{16}$ in.				
10 in.	1 $\times\frac{3}{16}$ in.	1 $\times\frac{1}{4}$ in.	$1\frac{3}{32}\times\frac{9}{32}$ in.	1 $\times\frac{9}{32}$ in.	$\frac{3}{8}$ in.	1 $\frac{1}{8}\times\frac{7}{32}$ in.				
11 in.	$1\frac{3}{32}\times\frac{13}{64}$ in.	$1\frac{3}{32}\times\frac{9}{32}$ in.	$1\frac{3}{16}\times\frac{19}{64}$ in.	$1\frac{3}{32}\times\frac{5}{16}$ in.	$\frac{7}{16}$ in.	$1\frac{3}{16}\times\frac{1}{4}$ in.				
12 in.	$1\frac{3}{16}\times\frac{7}{32}$ in.	$1\frac{3}{16}\times\frac{19}{64}$ in.	1 $\frac{1}{4}\times\frac{5}{16}$ in.	$1\frac{3}{16}\times\frac{11}{32}$ in.	$\frac{1}{2}$ in.	1 $\frac{1}{4}\times\frac{1}{4}$ in.				
13 in.	1 $\frac{1}{4}\times\frac{15}{64}$ in.	1 $\frac{1}{4}\times\frac{5}{16}$ in.	$1\frac{11}{32}\times\frac{11}{32}$ in.	1 $\frac{1}{4}\times\frac{3}{8}$ in.	$\frac{9}{16}$ in.					
14 in.	$1\frac{11}{32}\times\frac{1}{4}$ in.	$1\frac{11}{32}\times\frac{11}{32}$ in.	$1\frac{7}{16}\times\frac{3}{8}$ in.	$1\frac{11}{32}\times\frac{13}{32}$ in.	$\frac{5}{8}$ in.					
15 in.	$1\frac{7}{16}\times\frac{9}{32}$ in.	$1\frac{7}{16}\times\frac{3}{8}$ in.	1 $\frac{1}{2}\times\frac{13}{32}$ in.	$1\frac{7}{16}\times\frac{7}{16}$ in.	$\frac{11}{32}$ in.					
16 in.	1 $\frac{1}{2}\times\frac{19}{64}$ in.	1 $\frac{1}{2}\times\frac{13}{32}$ in.	$1\frac{9}{16}\times\frac{7}{16}$ in.	1 $\frac{1}{2}\times\frac{15}{32}$ in.	$\frac{3}{4}$ in.					

This Table of Sizes will give consumers, and all persons concerned in the use of Files, a fair idea of the sizes of the full parts of Files most generally used. It will also be found useful to persons who generally want Files of a certain width or thickness, and who may not know the corresponding length of such Files.

Established 1854. Centennial Award 1876.

KEYSTONE WORKS.

GEORGE GRIFFITHS. LOUIS REICHNER, JR.

GEORGE GRIFFITHS COMPANY

MANUFACTURERS OF

SOLID CAST STEEL

Shovels, Spades and Scoops

—AND—

DRAINAGE TOOLS.

Quality and Finish Guaranteed.

All Qualities Socket Strap Shovels, Spades and Scoops.

WE MAKE DRAIN CLEANERS, ALL SIZES.

We have reduced prices on

Cast Steel Wire Potato Scoops.

$12 PER DOZEN NET.

Malleable Iron Screening Scoops.

$15 PER DOZEN NET.

Shovel, Spade and Fork Handles, Coal Hods, Well Buckets, Chamber Pails, Ash Cans and Ash Barrels, Stove Shovels, Pokers, Pans, etc., all at

LOWEST MARKET PRICES.

Nos. 511, 513 and 515 Locust Street,

PHILADELPHIA, Pa., U. S. A.

SEND FOR PRICE LIST.

Molasses Gates.

No.	1	2	3	4	5
Inside Diameter	13-16	⅞	1¼	1⅜	1½
Bore	1	1⅛	1⅜	1⅝	1 13-16

John Wilson's English Butcher Knives.

LENGTH OF BLADE OF EACH NO.

No.	026	26	27	28	29	30	
Length	4½	5	5¼	5½	6	6½	inches.

No.	43	44	45	46	47	48	49	86
Length	7	8	9	10	11	12	13	14 ins.

Eley Bros.' ("E. B.") Percussion Caps

ARE NUMBERED IN THIS MANNER:

Smallest..	No.	9	24	10	11	18	12	13	14	..Largest.

English Gun Gauge.

SIZES EXPRESSED IN PARTS OF AN INCH.

	Number.											
Bore..	5	6	7	9	11	15	19	25	36	52	90	140	300
Inch..	1	15-16	⅞	13-16	¾	11-16	⅝	9-16	½	7-16	⅜	5-16	¼

The Sizes of Skates

COMPARE WITH SIZES OF SHOES AS FOLLOWS:

Skates, Inches..	7	7½	8	8½	9	9½	10	10½	11	11½
Shoes, No.	9¾	11	12½	1	2½	4	5½	7½	9	10½

Plate and Bedstead Casters.

SIZE, IN INCHES, OF WHEELS OF EACH.

Plate.....No	1	2	3	4	5	6	7
Size	⅞	1	1⅛	1¼	1⅜	1 7-16	1½

Bedstead, Old No.	1⅝.0	1⅝.1	1⅝.2	2 in 0	2 in 1	2 in 2	2 in heavy.
New "	101	102	103	104	105	106	107
Size	1⅜	1½	1⅝	1¾	1⅞	2	2¼

Hatter's Size Measure.

To obtain the correct size of the head, use a strip of paper—newspaper will do. Draw it tightly around the largest part of the head, and have the ends just meet. Then measure the length of the paper and the figures below will give you the size according to hatter's measure. An eighth of an inch either way will make no difference. These measures will answer for any style of hat or cap made:

18¾ inches is	5⅞	22¼ inches is	7
19 "	6	22½ "	7⅛
19⅜ "	6⅛	23 "	7¼
19¾ "	6¼	23⅜ "	7⅜
20¼ "	6⅜	23¾ "	7½
20¾ "	6½	24 "	7⅝
21 "	6⅝	24½ "	7¾
21⅛ "	6¾	25 "	7⅞
21⅞ "	6⅞	25¼ "	8

TRAVERS BROTHERS,

107 DUANE ST., AND 16 THOMAS ST.,

NEW YORK,

MANUFACTURERS AND SOLE AGENTS FOR

PEERLESS SASH CORDS AND TWINES.

BRAIDED EDGE

MEXICAN HAMMOCKS.

Peerless Hammock Spreaders.

ANCHOR HAMMOCK ROPES.

Liberty Mills Twines and Cords.

HARMONY MILLS TWINES AND CORDS.

PEERLESS SEA ISLAND TWINES.

GEM SEA ISLAND AND COTTON TWINES.

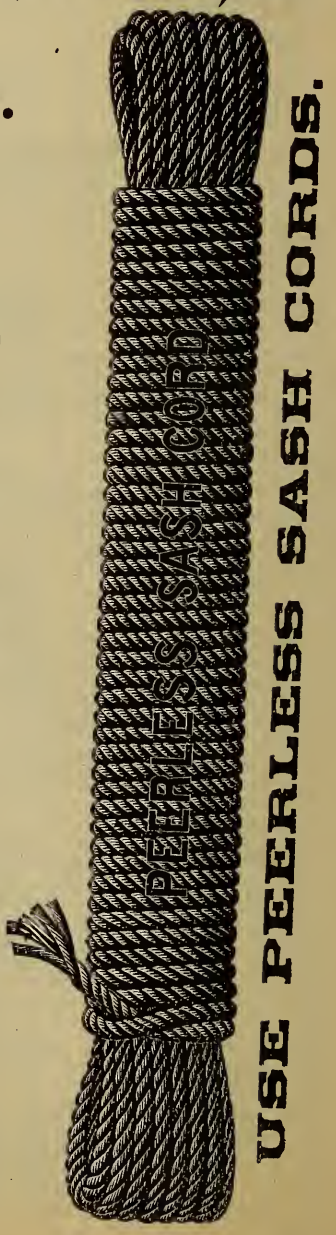
PEERLESS HAMMOCK HOOKS.

AGENTS FOR

THE SILVER LAKE COMPANY'S

SOLID BRAIDED

SASH CORDS AND LINES.



Office and Salesrooms,

107 DUANE STREET AND 16 THOMAS STREET,

NEW YORK CITY.

PROPORTIONS FOR UNITED STATES

STANDARD SCREW THREADS AND NUTS.

FROM HOOPES & TOWNSEND.

Diam. of Screw.	Thr'ads per inch.	Diamet'r at root of Thread.	Short Diame'tr	Long Diamet'r	Long Diamet'r	Thick-ness.
1/4	20	.185	1/2	37/64	7/10	1/4
5/16	18	.240	19/32	11/16	10/12	5/16
3/8	16	.294	11/16	51/64	63/64	3/8
7/16	14	.344	25/32	9/10	1 7/64	7/16
1/2	13	.400	7/8	1	1 15/64	1/2
9/16	12	.454	31/32	1 1/8	1 23/64	9/16
5/8	11	.507	1 1/16	1 7/32	1 1/2	5/8
3/4	10	.620	1 1/4	1 7/16	1 49/64	3/4
7/8	9	.731	1 7/16	1 21/32	2 1/32	7/8
1	8	.837	1 5/8	1 7/8	2 19/64	1
1 1/8	7	.940	1 13/16	2 3/32	2 9/16	1 1/8
1 1/4	7	1.065	2	2 5/16	2 53/64	1 1/4
1 3/8	6	1.160	2 3/16	2 17/32	3 3/32	1 3/8
1 1/2	6	1.284	2 3/8	2 3/4	3 23/64	1 1/2
1 5/8	5 1/2	1.389	2 9/16	2 31/32	3 5/8	1 5/8
1 3/4	5	1.491	2 3/4	3 3/16	3 57/64	1 3/4
1 7/8	5	1.616	2 15/16	3 13/32	4 5/32	1 7/8
2	4 1/2	1.712	3 1/8	3 5/8	4 27/64	2
2 1/4	4 1/2	1.962	3 1/2	4 1/16	4 61/64	2 1/4
2 1/2	4	2.176	3 7/8	4 1/2	5 31/64	2 1/2
2 3/4	4	2.426	4 1/4	4 29/32	6	2 3/4
3	3 1/2	2.629	4 5/8	5 3/8	6 17/32	3
3 1/4	3 1/2	2.879	5	5 13/16	7 1/16	3 1/4
3 1/2	3 1/4	3.100	5 3/8	6 7/64	7 39/64	3 1/2
3 3/4	3	3.317	5 3/4	6 31/32	8 1/8	3 3/4
4	3	3.567	6 1/8	7 3/32	8 41/64	4

BLOCK TIN PIPE.

CALIBER.	Wt. per ft LBS.	Wt. per ft OZ.	CALIBER.	Wt. per ft LBS.	Wt. per ft OZ.
1/8 in. strong		2 1/2	1/2 in. double ex-strong		15
1/4 inch ex-strong		5	5/8 in. ex-strong		9
double ex-strong.		6	double ex-strong		14
5/16 in. dou'le ex-strong		6 1/2	3/4 in. ex-strong		11
3/8 in. ex-strong		6	double ex-strong	1	0
double ex-strong.		8	1 in. double ex-strong		14
1/2 in. strong		6 1/2	double ex-strong	1	4
ex-strong		10			

CAST IRON BALLS.—WEIGHT.

	LBS.		LBS.		LBS.
2 in. diam.	1.09	4 1/2 in. diam	12.42	6 1/2 in. diam.	37.44
2 1/2 in. diam.	2.13	5 in. diam	17.04	7 in. diam.	46.76
3 in. diam.	3.68	5 1/2 in. diam	22.68	7 1/2 in. diam.	57.52
3 1/2 in. diam.	5.84	6 in. diam	29.48	8 in. diam.	69.81
4 in. diam.	8.73				

QUEEN ANNE SCREEN CO.,

BURLINGTON, VERMONT,

MANUFACTURERS OF THE

ADJUSTABLE QUEEN ANNE SCREEN.

This is a new departure in adjustable screens and is free from many objections found in others. It is the **only double-face screen,** and equally well finished on both sides. It has a box panel, and can be adjusted without the friction noticeable in all other adjustable screens.

They are made of Pine and Bass Wood stained in imitation of Black Walnut, with thimbles on one side.

Or made of Maple or Birch stained in imitation of Black Walnut, finished in hard oil or shellac, with lifts and face plates.

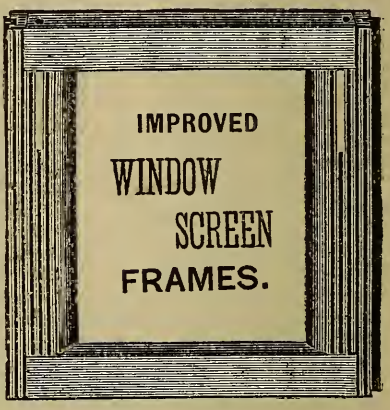
Also stained in imitation of Cherry or Natural Wood and cabinet finished, with lifts and face plates.

The Side Sticks are $\frac{7}{8}$x2 inches. End $1\frac{7}{8}$x1 inch. Stained in imitation of Black Walnut.

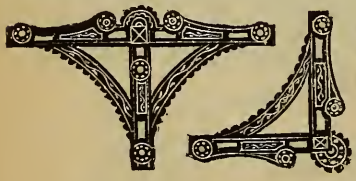
Each Set is composed of Frame Slide and Strips to tack over wire.

These Frames are beaded and are slit 6 inches on one end to facilitate fitting to any window, by cutting if necessary.

These Sides are grooved the entire length, doing away with necessity of cutting grooves in end of top and bottom Sticks as in other makes.



Corners and Sticks for Windows and Doors.



Queen Anne Screen Co.,

MANUFACTURERS,

BURLINGTON, VERMONT.

GENERAL AGENTS:

JOHN H. GRAHAM & CO., 113 Chambers St., New York.

TABLE

SHOWING THE AVERAGE NUMBER OF COLD PRESSED NUTS IN A KEG. 150 LBS EACH, SQUARE AND HEXAGON, OF STANDARD SIZES,

As adopted by "The Association of Bolt and Nut Manufacturers of the U. S."

Width.	Thickness.	Hole.	Bolt.	No. of Square.	No. of Hexagon
11-32	5-32	3-32	1-8	45,000	
13-32	3-16	5-32	3-16	22,500	
1-2	1-4	7-32	1-4	10,000	10,500
5-8	5-16	9-32	5-16	5,106	6,666
3-4	3-8	11-32	3-8	2,727	4,528
7-8	7-16	13-32	7-16	1,904	2,057
7-8	1-2	7-16	1-2	1,695	1,890
1	1-2	7-16	1-2	1,218	1,538
1 1-8	1-2	1-2	4-16	1,016	1,245
1 1-8	5-8	9-16	5-8	885	957
1 1-4	5-8	9-16	5-8	638	740
1 3-8	3-4	21-32	3-4	450	555
1 1-2	3-4	21-32	3-4	368	430
1 5-8	7-8	25-32	7-8	260	270
1 3-4	7-8	25-32	7-8	243	252
1 3-4	1	7-8	1	249	257
2	1	7-8	1	163	204
2	1 1-8	15-16	1 1-8	143	168
2 1-4	1 1-8	15-16	1 1-8	109	150
2 1-4	1 3-8	1 1-16	1 3-8	85	120
2 1-2	1 1-4	1 1-16	1 1-4	84	93
2 3-4	1 3-8	1 3-16	1 3-8	55	60
3	1 1-2	1 5-16	1 1-2	51	56
3 1-4	1 5-8	1 7-16	1 5-8	39	44
3 1-2	1 3-4	1 9-16	1 3-4	32	35
3 3-4	1 7-8	1 11-16	1 7-8	28	30
4	2	1 13-16	2	20	22

TAPER AND PLUG TAPS.

Standard Number of Threads to the Inch.

Size. Inches.	RIGHT HAND.								LEFT HAND.	
1/4					30	32				
5/16				24	26	28				
1/4			16	18	20	22	24	26		
5/16		14	16	18	20	22				
3/8	12	14	16	18	20					
7/16	10	12	14	16	18				14	
1/2	10	12	14	16	18				12	14
9/16		12	14						12	
5/8	10	11	12	14	16				10	12
3/4	7	8	9	10	12	14			10	12
7/8	8	9	10						9	
1	7	8	9	10					8	9
1 1/4	6	7	8	9					8	9
1 1/2	6	7	8						6	7.8

TABLE

Showing the Average Number of Washers in a Keg of 150 Pounds, of Each Standard Size.

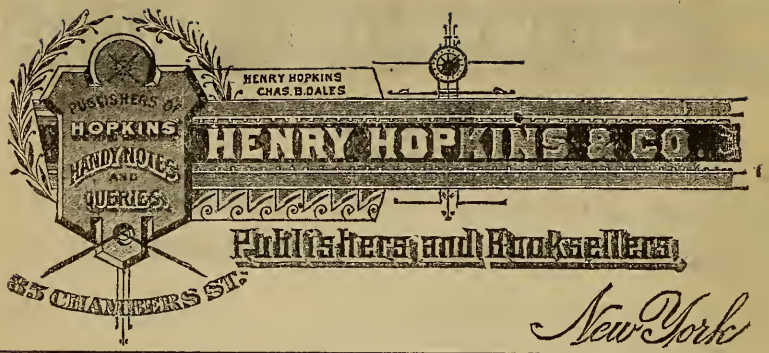
AS ADOPTED BY

"The Association of Bolt and Nut Manufacturers of the United States."

Diameter.	Size of Hole.	Thicknes Wire Gauge.	Size of Bolt	No. in 150 pounds.
1/2	1/4	No. 18	3/16	80,000
5/8	5/16	" 16	1/4	34,285
3/4	5/16	" 16	1/4	22,000
7/8	3/8	" 16	5/16	18,500
1	7/16	" 14	3/8	10,550
1 1/4	1/2	" 14	7/16	7,500
1 3/8	9/16	" 12	1/2	4,500
1 1/2	5/8	" 12	9/16	3,850
1 3/4	11/16	" 10	5/8	2,500
2	13/16	" 10	3/4	1,600
2 1/4	15/16	" 9	7/8	1,300
2 1/2	1 1/16	" 9	1	950
2 3/4	1 1/4	" 9	1 1/8	700
3	1 3/8	" 9	1 1/4	550
3 1/2	1 1/2	" 9	1 3/8	450

Standard Sizes of Heads for Bolts.

Diam. of Bolt.	Square Head.		Hexagon Head		Button Head.		Countersunk Head.	
	WIDE.	THICK.	WIDE.	THICK.	WIDE.	THICK.	WIDE.	THICK
1/4	7/16	3/16	7/16	1/4	11/16	5/32	1/2	3/16
5/16	1/2	1/4	1/2	5/16	13/16	5/32	5/8	1/4
3/8	5/8	5/16	5/8	3/8	1/4	1/4	11/16	1/4
7/16	11/16	3/8	11/16	7/16	1	1/4	3/4	1/4
1/2	13/16	7/16	13/16	1/2	1 1/8	5/16	7/8	1/4
9/16	7/8	1/2	7/8	9/16	1 1/4	5/16	15/16	5/16
5/8	1	1/2	1	5/8	1 1/2	7/16	1 1/8	5/16
3/4	1 3/16	5/8	1 3/16	3/4	1 3/4	1/2	1 3/8	3/8
7/8	1 3/8	3/4	1 3/8	7/8	1 7/8	5/8	1 1/2	3/8
1	1 1/2	7/8	1 9/16	1	2 1/8	3/4		
1 1/8	1 5/8	1	1 11/16	1 1/8				
1 1/4	1 3/4	1 1/8	1 13/16	1 1/4				



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THE PUBLISHERS

having made every effort to make this Book an acceptable gift to the Dealer to whom it is sent, would be pleased to receive a Postal Card acknowledgment of its having safely arrived.

APPROXIMATE WEIGHTS OF STRAP AND T HINGES.

Weight per dozen. Furnished by Stanley Works.

HEAVY STRAP HINGES.

Size....	4	5	6	8	10	12	14	16	ins.
Weight.	6¾	10½	19½	32¼	55¼	74½	89¼	108½	lbs.

EXTRA HEAVY T HINGES.

Size.....	6	8	10	12	14	16	ins.
Weight	20¾	34 ¾	54	78	83¼	87¾	lbs.

STRAP AND T HINGES ARE COUNTERSUNK FOR SCREWS.

Inches		3	4	5	6	8	10	12	14	16	18
Light Strap..	Size Screws	6	7	8	9	10	10	12	13	13	
Heavy Strap.....	"		9	9	11	12	14	16	16	16	
Light T...	"	7	7	8	8	9	10	11	12		
Heavy T.....	"				9	10	11	12	13	13	13
Extra Heavy T	"			10	11	13	14	16	16	16	
Hinge Hasps.....	"	6	7		9	10	10	12			

WROUGHT BUTTS—Countersunk for Screws.

TABLE BUTTS AND BACK FLAPS.

Inches	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	2⅞	2
Size Screw	6	6	7	7	7	8	8	9	9	9

NARROW WROUGHT BUTTS.

Inches..	1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4	4½	5	5½	6
Screws..	5	6	7	7	8	8	9	9	10	12	12	12	12	14	14	14	14

LIGHT NARROW AND LIGHT LOOSE PIN.

Inch	¾	1	1¼	1½	1¾	2	2¼	2½	3
Screws.....	2	3	3	5	5	6	6	6	7

LOOSE PIN OR BROAD.

Size.....	2x2 to 2½x2	2½x2½ to 3x3	3x3½	3½x3 to 4½x4	4½x4½ to 5½	5x5 to 6x7
Screws.....	9	10	11	12	13	14

CAST BUTTS

ARE COUNTERSUNK FOR SCREWS AS FOLLOWS:

NARROW, FAST OR LOOSE JOINT.

Inch.....	1½	1¾	2	2¼	2½	3	3¼	3½	4	4½	5	6
Screws	6	7	7	8	8	8	10	10	10	12	14	12

PARLIAMENT.

Inch.....	2½ to 3½	3¾ and 4	4½ to 7½	8 and 8½
Screw	8	10	11	13

BROAD, FAST, AND LOOSE JOINT AND LOOSE PIN.

Inch.....	2x2 to 2½x3	3x2½ to 3½x3¼	3½x4
Screw.....	8	10	11

Inch	3½x5	4x3	4x3½ to 4¼x4½	4½x5 and upwards
Screw.....	10	10	11	13

C. P. LEGGETT MF'G. CO. OF N. J.

OFFICE AND FACTORY:

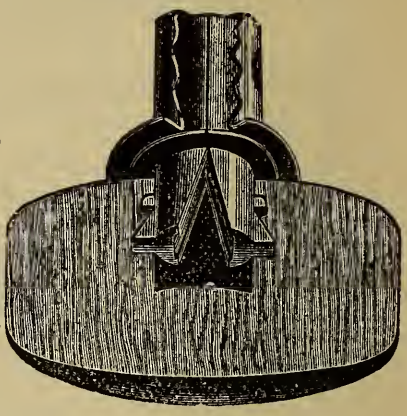
201 to 207 East Jersey street, Elizabeth, N. J.

MANUFACTURERS OF

Porcelain, Jet and Wood

DOOR KNOBS.

No Lead or Cement Used in Fastening Shanks and Knobs.



This is the only Knob now on the market that cannot possibly become detached or come off without breaking the knob. Highly endorsed and sold by the leading Hardware Houses of the United States and Canada.

COSTS NO MORE THAN ORDINARY KNOBS.

ASK YOUR DEALER FOR IT AND TAKE NO OTHER.

Price-Lists on Application.

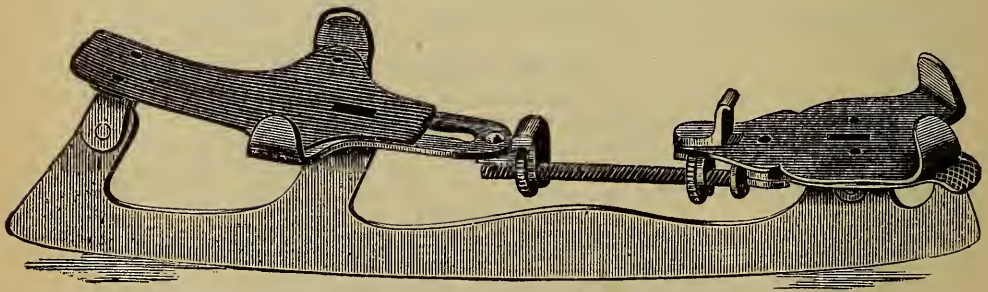
C. P. LEGGETT MFG. CO. OF N. J.

JAMES W. MASON, JR.,

MANUFACTURER OF

ICE AND ROLLER SKATES.

"THE CZAR."



SKATE STRAPS, TRIMMINGS, ETC.,

DOG COLLARS,

And all Kinds of Leather Goods.

NO. 75 CHAMBERS ST., - NEW YORK.

WROUGHT BRASS BUTTS.

Width when Open, and Sizes of Screws Required.

WIDTH OF BRASS BUTTS, WHEN OPEN.

Size.....Inches	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{3}{4}$
Narrow.....Width	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$
Middle.....	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	1	1
Broad.....	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{8}$
Desk.....	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{1}{2}$

Size.....Inches	$1\frac{7}{8}$	2	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	$3\frac{1}{2}$	...
Narrow.....Width	1	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$1\frac{3}{4}$	2	...
Middle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$2\frac{1}{8}$	...
Broad.....	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$	$1\frac{7}{8}$	2	$2\frac{1}{4}$	..
Desk.....	$2\frac{3}{4}$	3	..	...	...	...	...	...	...

BRASS BUTTS ARE COUNTERSUNK FOR SCREWS AS FOLLOWS:

Size.....Inch	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
Narrow....Size of Screw	0	1	1	2	2	3	4	4	4
Middle.....	0	1	1	2	2	3	4	4	4
Broad.....	0	1	1	2	2	3	4	4	4
Desk.....	1	2	2	4	4	4	4	5	5

Size.....Inch	$1\frac{3}{4}$	$1\frac{7}{8}$	2	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	$3\frac{1}{2}$
Narrow....Size of Screw	4	5	5	5	6	6	7	7	8
Middle.....	4	5	5	5	6	6	7	7	8
Broad.....	4	5	5	5	6	7	7	7	8
Desk.....	6	6	7	...	...	...	...	...	...

EMERY AND CORUNDUM

ARE RANKED OR GRADED AS FOLLOWS:

Nos.	8–10.....	Represents a	Wood rasp.
"	16–20.....	"	Rough file.
"	24–30.....	"	Middle cut file.
"	36–40.....	"	Bastard cut file.
"	46–60.....	"	Second cut file.
"	70–80.....	"	Smooth cut file.
"	90–100.....	"	Superfine cut file.
"	120–FFF.....	"	Dead smooth file.

Baeder & Adamson's Emery Paper and Cloth

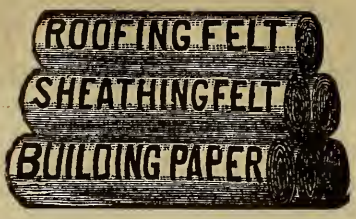
COMPARE WITH GRADE AS FOLLOWS:

Nos.	000	00	0	100	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Emery....	Crocus	Flour	120	100	90	80	70	60	54	46

DIFFERENT STANDARDS FOR WIRE GAUGE IN USE IN THE UNITED STATES.

Dimensions of Sizes, in Decimal Parts of an Inch.

Number of Wire Gauge.	American, or Brown & Sharpe.	Birmingham, or Stubs's.	Washb'n & Moen Mfg. Co., Worcester, Mass.	Trenton Iron Co., Trenton, N. J.	G. W. Prentiss, Holyoke, Mass.	Old English from Brass Mfrs'. List.	Number of Wire Gauge.
000000	.....	....	.46	....	....	....	000000
00000	.....	...	.43	.45		....	00000
0000	.46	.454	.393	4	....	....	0000
000	.40964	.425	.362	.36	.3586	....	000
00	.3648	.38	.331	.33	.3282	....	00
0	.32495	.34	.307	.305	.2994	....	0
1	.2893	.3	.283	.285	.2777	....	1
2	.25763	.284	.263	.265	.2591	....	2
3	.22942	.259	.244	.245	.2401	....	3
4	.20431	.238	.225	.225	.223	....	4
5	.18194	.22	.207	.205	.2047	....	5
6	.16202	.203	.192	.19	.1885	....	6
7	.14428	.18	.177	.175	.1758	....	7
8	.12849	.165	.162	.16	.1605	....	8
9	.11443	.148	.148	.145	.1471	....	9
10	.10189	.134	.135	.13	.1351	....	10
11	.090742	.12	.12	.1175	.1205	....	11
12	.080808	.109	.105	.105	.1065	....	12
13	.071961	.095	.092	.0925	.0928	....	13
14	.064084	.083	.08	.08	.0816	.083	14
15	.057068	.072	.072	.07	.0726	.072	15
16	.05082	.065	.063	.061	.0627	.065	16
17	.045257	.058	.054	.0525	.0546	.058	17
18	.040303	.049	.047	.045	.0478	.049	18
19	.03589	.042	.041	.04	.0411	.04	19
20	.031961	.035	.035	.035	.0351	.035	20
21	.028462	.032	.032	.031	.0321	.0315	21
22	.025347	.028	.028	.028	.029	.0295	22
23	.022571	.025	.025	.025	.0261	.027	23
24	.0201	.022	.023	.0225	.0231	.025	24
25	.0179	.02	.02	.02	.0212	.023	25
26	.01594	.018	.018	.018	.0194	.0205	26
27	.014195	.016	.017	.017	.0182	.01875	27
28	.012641	.014	.016	.016	.017	.0165	28
29	.011257	.013	.015	.015	.0163	.0155	29
30	.010025	.012	.014	.014	.0156	.01375	30
31	.008928	.01	.0135	.013	.0146	.01225	31
32	.00795	.009	.013	.012	.0136	.01125	32
33	.00708	.008	.011	.011	.013	.01025	33
34	.006304	.007	.01	.01	.0118	.0095	34
35	.005614	.005	.0095	.0095	.0109	.009	35
36	.005	.004	.009	.009	.01	.0075	36
37	.004453	....	.0085	.0085	.0095	.0065	37
38	.003965	....	.008	.008	.009	.00575	38
39	.003531	....	.0075	.0075	.0083	.005	39
40	.003144	....	.007	.007	.0078	.0045	40



WARREN-EHRET COMPANY

MANUFACTURERS,

428 MARKET STREET,

PHILADELPHIA.

JOHNSTON'S

STANDARD DRY SIZED

KALSOMINE AND FRESCO PAINTS,

Gold Medal, New Orleans, 1884-5, and Eight First-Class Awards.

CHEAPER THAN WALL PAPER OR OIL PAINT.

READY FOR USE

- **Pure White and Beautiful Tints.**
- **Purifies and Beautifies.**
- **Will not Rub and Scale from the Wall.**
- **Invaluable in Cleansing and Disinfecting Walls Impregnated with Germs of Disease.**
- **Mixed in 5 Minutes Ready for the Brush, by the addition of Water Only.**
- **An Inexperienced Person can use it.**
- **Five Pounds will Cover with a Good Body 500 Square Feet, on a Hard-Finished Wall.**

Ask for "JOHNSTON'S DRY SIZED KALSOMINE,"

And see that you do not get any poor substitute. For sale by Paint, Drug and Hardware Dealers everywhere.

Dry Kalsomine and Fresco Paint Works,

NOS. 25 AND 27 JOHN ST., BROOKLYN, N. Y.

ROUND OR OVAL-HEAD IRON RIVETS.

Number of Rivets in One Pound.

APPROXIMATE.

Size.	3/8	0	5/16	1	2	3	1/4	4	5	6	3/16	7	8	9
3/8	...	...	...	...	...	...	...	...	.....	154	188	221	256	334
5/16	32	42	51	57	65	75	80	89	108	131	159	185	215	278
5/16	29	37	45	50	57	67	70	78	94	114	138	158	185	238
3/4	26	33	41	45	51	59	63	70	84	101	122	139	163	208
7/8	24	30	37	41	46	54	57	63	75	91	109	123	145	185
1	22	28	34	37	42	49	52	57	68	82	98	111	131	166
1 1/8	20	26	31	34	39	45	47	53	63	75	90	101	119	151
1 1/4	19	24	29	32	36	42	44	49	58	69	83	93	109	138
1 3/8	18	22	27	29	33	39	41	45	54	54	76	86	101	127
1 1/2	17	21	25	28	31	37	38	42	51	59	71	80	94	119
1 3/4	15	18	22	24	27	33	34	40	44	55	63	70	82	104
2	13	17	20	22	25	29	30	35	40	47	56	62	73	92
2 1/4	12	15	18	19	22	27	28	32	36	42	50	56	66	83
2 1/2	11	14	17	18	20	24	25	29	33	39	46	50	60	75
2 3/4	10	13	15	17	19	22	23	26	30	36	42	46	55	67
3	9	12	14	15	17	21	22	24	28	33	39	43	51	64
3 1/4	8 1/2	11	13	14	16	19	20	23	26	31	36	40	47	59
3 1/2	8	10 1/2	12	13 1/2	15	18	19	21	24	29	34	38	44	55
3 3/4	7 1/2	9 3/4	11 3/4	12 3/4	14	17	18	20	23	27	32	35	41	52
4	7 1/4	9 1/4	11	12	13	16	17	18	21	25	30	33	38	49
4 1/4	7	8 3/4	10 1/2	11 1/4	12 3/4	15	16	17	20	24				
4 1/2	6 1/2	8 1/4	10	10 3/4	12	14	15	16	19	23				
4 3/4	6 1/4	8	9 1/4	10	11 1/2	13 3/4	14 3/4	15 3/4	18	22				
5	6	7 1/2	9	9 3/4	11	13	14	15	17	21				
5 1/4	5 3/4	7 1/4	8 1/2	9 1/4	10 1/2	12 1/2	13 1/2	14 1/2	16 1/2	20				
5 1/2	5 1/2	7	8 1/4	9	10	12	13	14	16	19				
5 3/4	5 1/4	6 3/4	7 3/4	8 1/2	9 1/2	11 1/2	12 1/2	13 1/2	15	18				
6	5	6 1/2	7 1/2	8 1/4	9 1/4	11	12	13	14	17				

SHRINKAGE OF CASTINGS.

In making allowance for shrinkage in casting, pattern-makers understand that different shapes will shrink differently. The standard table of allowance for shrinkage in use in the best shops of the country is as follows:

For Loam Castings.....1/10 inch per foot.
" Green Sand Castings.....1/10 inch per foot.
" Dry Sand Castings.....1/10 inch per foot.
" Brass Castings.....3/16 inch per foot.
" Copper Castings.....3/16 inch per foot.
" Bismuth Castings.....5/32 inch per foot.
" Tin Castings..... 1/4 inch per foot.
" Zinc Castings.....5/16 inch per foot.
" Lead Castings.....5/16 inch per foot.

JOHN H. GRAHAM. WM. A. GRAHAM.

JOHN H. GRAHAM & CO.,

ESTABLISHED 1870.

HARDWARE MANUFACTURERS' AGENTS.

All Goods at Factory Prices.

P.-O. Box 1042. **113 Chambers St. and 95 Reade St., New York.**

AGENTS AS FOLLOWS:

AMERICAN MACHINE CO.,
Freezers, Wringers, Fluting Machines, &c.

LANE BROS.,
Grocer's Coffee Mills, Self-Measuring Faucets and Lane's Hangers and Track.

HENRY DISSTON & SONS,
Saws, Tools, Files, &c.

HARTFORD HAMMER CO.,
Hammers Forged from Solid Cast Steel.

NEW HAVEN COPPER CO.,
Cast Steel Augers and Bits, &c.

AUBURN TOOL CO.,
Bench and Fancy Planes, all kinds.

GEORGE M. EDDY & CO.,
Measuring Tapes. Largest line in the world.

LORING & PARKS,
Tacks and Rivets.

HOBART B. IVES & CO.,
Sash Locks, Door Bolts, &c.

QUEEN ANNE SCREEN CO.,
Extension Screens, Window Sticks and Corners, &c.

BARTON BELL CO.,
Hand, House, Car and Sheep Bells, Sleigh Bells, &c.

DOUBLE-POINTED TACK CO.,
Double-Pointed Tacks, Blind Staples, Spring Staples, &c.

UNITED STATES CORD CO.,
Braided Sash Cord, &c.

ROMER & CO.,
Night Latches, Iron and Brass Padlocks.

BAEDER FLINT PAPER CO.,
Flint Paper, Emery Cloth, &c.

AMIDON & BASTEDO,
Braces, &c.

E. S. HOTCHKISS,
Hotchkiss Rat Killers, Metallic Mouse Traps.

A. G. COES & CO.,
Coes' Genuine Screw Wrenches.

IRON CITY TOOL WORKS,
Vises, Picks, Mattocks, Grub Hoes, Sledges, &c.

HENRY KNICKERBACKER,
Scythes, Grass Hooks, Axes, Hatchets and Tools.

SEYMOUR SMITH AND SON,
Pruning Shears, Breast Drills, Bull Rings, &c.

DERBY & BALL,
Scythe Snaths.

CHAPIN BOLT & NUT CO.,
Carriage Bolts, Machine Bolts, Lag Screws, &c.

AMERICAN SCREW CO.,
Wood Screws, &c.

WATERTOWN THERMOMETER CO.,
Thermometers, Storm Glasses, &c.

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Scales, &c.

LAWRENCE CURRY COMB CO.,
Curry Combs.

T. C. RICHARDS HDW. CO.,
Picture Nails, Bright Wire Goods, &c.

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Scissors and Shears.

A. W. BRINKERHOFF & SON,
Universal Corn Huskers.

P. LOWENTRAUT,
Mechanics' and Plumbers' Tools, Skates, &c.

HARRISBURG HANDLE CO.,
Pick, Axe, Hammer, Sledge and Hatchet Handles.

D. W. BOSLEY & CO.,
Weather Strips, Floor Scrubbers, Window Cleaners, &c.

FRED. J. MEYER MFG. CO.,
Corn Poppers, Fly Traps, Muzzles, Rat Traps, &c.

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Scythe Stone. All kinds Oil Stones, &c.

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Geneva Fluters, Laundry Irons, &c.

EDWARD STORM SPRING CO.,
Cannon Diamond-Pointed Nail Set and N. Y. Safety Dumb Waiters.

RIPLEY MFG. CO.,
Mallets, Bung Starters, Mouse Traps, &c.

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Lawn Mowers, Beef Cutters, &c.

BURRELL & WHITMAN,
Butter and Cheese Tryers, Flour Testers, &c.

C. S. BELL & CO.,
Church and Farm Bells.

CHALFANT MFG. CO.,
Toilet and Gas Irons.

BOSTWICK & BURGESS,
Carpet Sweepers.

NEW SCOTT MFG. CO.,
Apple, Peach, Orange Parers, Ice Creepers, Fruit Presses, &c.

DETROIT BLOCK WORKS,
Wood and Iron Blocks.

CRONK HANGER CO.,
Barn Door Hangers, Cronk Plyers, &c.

Size, Weight, Length and Strength of Iron Wire.

BIRMINGHAM WIRE GAUGE.

Wire Guage.	Diameter.	Weight of 100 Yards.	Weight of 1 mile.	Length of 1 Bundle.	Length of 1 Cwt.	Direct Strain.	
						Area of Section.	Breaking Weight.
No.	Inches.	Lbs.	Lbs.	Yards.	Yards.	Sq. in,	Lbs.
5-0	0 546	161 00	2830	39	70	0 163	13070
4-0	0 425	140 00	2460	45	80	0 142	11350
3-0	0 394	120 00	2113	52	93	0 122	9755
2-0	0 363	102 00	1794	62	110	0 103	8280
0	0 331	84 72	1490	74	132	0 086	6880
1	0 300	68 75	1210	91	162	0 071	5650
2	0 280	59 90	1054	105	187	0 062	4930
3	0 260	51 65	909	121	215	0 053	4250
4	0 240	44 00	775	143	255	0 045	3620
5	0 220	37 00	651	170	303	0 038	3040
6	0 200	30 56	538	203	361	0 031	2510
7	0 185	26 15	461	239	428	0 0265	2220
8	0 170	22 10	389	286	509	0 023	1840
9	0 155	18 36	323	342	609	0 0195	1560
10	0 140	14 97	264	420	747	0 016	1280
11	0 125	11 95	211	529	939	0 0125	1000
12	0 110	9 24	163	700	1244	0 010	800
13	0 095	7 05	124	893	1589	0 0071	568
14	0 085	5 51	97	1142	2031	0 0057	456
15	0 075	4 29	76	1468	2608	0 0044	352
16	0 065	3 22	57	1954	3473	0 0033	264
17	0 057	2 48	44	2540	4515	0 0026	208
18	0 050	1 91	34	3150	5600	0 0020	160
19	0 045	1 55	27	4085	7246	0 0016	128
20	0 040	1 22	21	4912	9168	0 0013	104
21	0 035	0 94	17	6416	11980	0 0010	80
22	0 030	0 69	12	8736	16300	0 0007	56

Sizes Expressed in Fractions of an Inch.

1-32 in.—No. 5-0 full
7-16 in.—No. 4-0 full
13-32 in.—No. 3-0 full
3-8 in.—No. 2-0 full
11-32 in.—No. 0 full
5-16 in.—No. 1 full.
9-32 in.—No. 2
1-4 in.—No. 3½
7-32 in.—No. 5
3-16 in.—No. 7
5-32 in.—No. 9
1-8 in —No. 11
1-10 in —No. 13 full
1-12 in —No. 14
1-16 in.—No. 16
1-32 in.—No. 22

Telegraph and Telephone Wire.

FROM TRENTON IRON COMPANY LIST.

WEIGHT PER MILE-OHM.—This term is to be understood as distinguishing the *resistance of material* only, and means the weight of such material required per mile to give the resistance of one ohm. To ascertain the mileage resistance of any wire, divide the "weight per mile-ohm" by the weight of the wire per mile. Thus in a grade of Extra Best Best, of which the weight per mile-ohm is 5,000, the mileage resistance of No. 6 (weight per mile 525 lbs.) would be about 9½ ohms; and No. 14 steel wire, 6,500 lbs., weight per mile-ohm (95 lbs. weight per mile), would show about 69 ohms.

The grades of LINE WIRE are generally known to manufacturers, consumers, and the trade in this country, as "Extra Best Best" (E. B. B.), "Best Best" (B. B.), "Best" (B.), and "Steel."

The "Extra Best Best" is made of the very best iron, as nearly pure as any commercial iron, soft, tough, uniform, and of very high conductivity, its weight per mile-ohm being about 5,000 lbs.

The "Best Best" is of excellent iron, showing in mechanical tests almost as good results as the E. B. B., but not quite as soft, and being somewhat lower in conductivity; weight per mile-ohm about 5,700 lbs.

Some manufacturers have ceased to make the grade known as "Best"—which term has become to some extent a misnomer, as it has been much applied to inferior wire hardly suited for telegraphic purposes, and having a weight per mile-ohm of 6,000 to 7,000 lbs. It is found that wire made from Bessemer or Open-Hearth Steel, low in carbon, gives better satisfaction, being tougher and stronger than iron wire that can be furnished at an equal price per pound, and offering no more resistance to the electric current. This "Steel" wire is well suited for Telephone or short Telegraph Lines, and the weight per mile-ohm is about 6,500 lbs.

The following are (approximately) the weights per mile of various sizes of Galvanized Telegraph Wire, drawn by Trenton Iron Co.'s gauge:

No.	4,	5,	6,	7,	8,	9,	10,	11,	12,	13,	14,
Lbs.	720,	610,	525,	450,	375,	310,	250,	200,	160,	125,	95.

Telegraph Wire is frequently made by Birmingham wire gauge, but wire of *any desired weight per mile* can be made to order.

Sizes of Wire Used in Telegraph and Telephone Lines.

No. 4. Has not been much used until recently; is now used on important lines where the multiplex systems are applied.
No. 5. Little used in the United States.
No. 6. Used for important circuits between cities.
No. 8. Medium size for circuits of 400 miles or less.
No. 9. For similar locations to No. 8, but on somewhat shorter circuits; until lately was the size most largely used in this country.
No. 10. } For shorter circuits, railway telegraphs, private lines, police and fire alarm
No. 11. } lines, &c.
No. 12. For telephone lines, police and fire alarm lines, &c.
No. 13. } For telephone lines and short private lines; steel wire is used most generally in
No. 14. } these sizes.

THE COATING OF TELEGRAPH WIRE with zinc as a protection against oxidation is now generally admitted to be the most efficacious method. Some years ago telegraph wire used to be boiled in linseed oil, which process cost less than galvanizing and protected the wire tolerably well, except where it was exposed to the action of sea air. It can still be coated in that manner if required; but a good coat of zinc is the best protection against rust, and wire so coated is moreover a better conductor than plain wire.

JOINTS IN TELEGRAPH WIRES.—Above is an illustration of the ordinary "telegraph joint." The fewer the joints in a line the better; hence the advantage of the present method of making single pieces of wire weighing 90 or 100 lbs. (or even 150 lbs.) instead of (as a few years ago) 30 to 50 lbs. All joints should be carefully made and well soldered over, for a bad joint may cause as much resistance to the electric current as several miles of wire.

July 8, 1886.

STEEL WIRE NAILS.

Standard Price List.

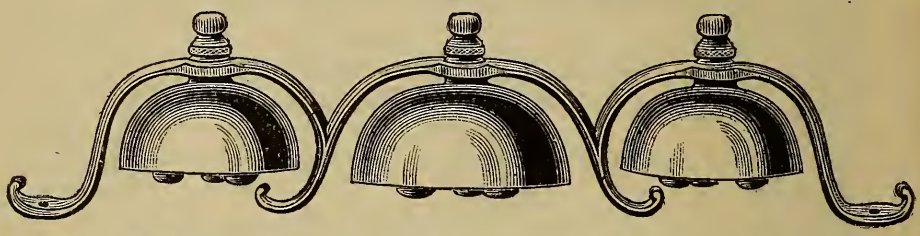
Size.	Length of Nail.	Add to the price of 10d Com. Standard.
Common, Fence, Flooring Brads, Shingle and Tobacco Nails.		
10d-60d.	3 in. to 6 in.	Rate
8d & 9d.	2½ in. & 2¾ in.	$ 35
6d & 7d.	2 in. & 2¼ in.	75
4d & 5d.	1½ in. & 1¾ in.	1 10
3d.	1¼ inch	2 25
2d.	1 inch	3 75
Barbed Common.		
10d-60d.	3 in. to 6 in.	40
8d & 9d.	2½ in. & 2¾ in.	75
6d & 7d.	2 in. & 2¼ in.	1 00
4d & 5d.	1½ in. & 1¾ in.	1 50
3d.	1¼ inch	2 50
2d.	1 inch	4 00
Casing and Smooth Box.		
10d-40d.	3 in. to 5 in.	75
8d & 9d.	2½ in. & 2¾ in.	1 25
6d & 7d.	2 in. & 2¼ in.	1 50
4d & 5d.	1½ in. & 1¾ in.	2 00
3d.	1¼ inch	3 00
2d.	1 inch	4 00
Barbed Box, 25c. add to Smooth.		
Smooth Finishing Nails.		
2d.	1 inch	5 00
3d.	1¼ inch	4 00
4d & 5d.	1½ in. & 1¾ in.	2 75
6d & 7d.	2 in. & 2¼ in.	2 00
8d & 9d.	2½ in. & 2¾ in.	1 50
10d-20d.	3 in. to 4 in.	1 25
For Barbed, 25c. add to Smooth.		
Fine Nails.		
2d.	1 inch	4 50
3d.	1⅛ inch	3 75
4d.	1½ inch	2 75
Lining Nails.		
	¾ inch.	6 00
	⅞ inch.	5 00
	1 inch.	4 50

Size.	Length of Nail.	Add to the price of 10d Com. Standard.
Barrel Nails.		
	¾ inch	$5 00
	⅞ inch	4 50
	1 inch	3 75
	1⅛ inch	2 60
	1¼ inch	2 25
	1⅜ inch	1 50
	1½ inch	1 10
Slating Nails.		
2d.	1 inch	3 00
3d.	1½ inch	2 00
4d.	1½ inch	1 50
5d.	1¾ inch	1 25
Barbed Roofing Nails.		
	¾ inch	4 50
	⅞ inch	3 50
2d.	1 inch	3 00
3d.	1¼ inch	2 25
4d.	1½ inch	1 75
5d.	1¾ inch	1 50
6d.	2 inch	1 25
Barbed Oval-Head Car Nails. Light and Heavy.		
4d.	1½ inch	1 75
5d.	1¾ inch	1 50
6d & 7d.	2 in. & 2¼ in.	1 25
8d & 9d.	2½ in. & 2¾ in	1 00
10d-60d.	3 in. to 6 in.	75
Clinch Nails.		
2d.	1 inch	3 50
3d.	1¼ inch	2 75
4d & 5d.	1½ in. & 1¾ in.	2 00
6d-20d.	2 in. to 4 in.	1 75
Wire Spikes.		
All sizes.	3 in. to 9 in.	35

W. H. CHAPMAN & CO.,

MANUFACTURERS OF

Fine Saddlery Hardware



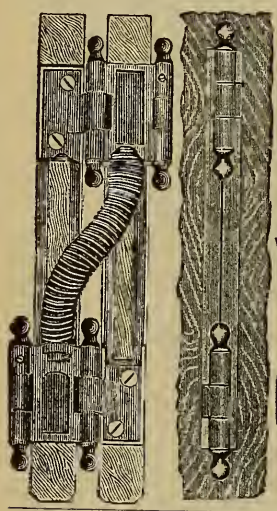
CHIME SLEIGH BELLS, CALL BELLS.

Iron Toys and Novelties.

Specialties in Hardware and Light Metallic Goods Generally.

MIDDLETOWN, CONN.

CHICAGO SPRING BUTT.



THE MOST POPULAR LINE

SPRING HINGES

IN THE WORLD.

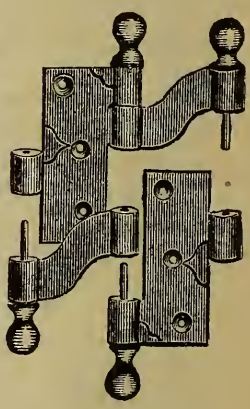
Write for Catalogue and Prices.

MANUFACTURED BY

CHICAGO SPRING BUTT CO.,

Lake and Union Sts., Chicago.

CHICAGO BLANK BUTT.



1	21	31	41	51		3	23	33	43	53
Jap'ed Pair.	Nickel Plated. Pair.	Bronze Plated. Pair	Real Bronze. Pair.	Brass. Pair.	DOORS.	Jap'ed Pair.	Nickel P ated. Pair.	Bronze Plated. Pair.	Real Bronze Pair.	Brass. Pair.
$1.20	$3.00	$3.00	$8.50	$8.50	⅞ to 1 in.	$0.60	$1.50	$1.50	$4.25	$4.25
1.50	3.75	3.75	9.50	9.50	1⅛ to 1¼ in.	0.75	1.88	1.88	4.75	4.75
2.50	5.50	5.50	12.00	12.00	1⅜ to 1½ in.	1.25	2.75	2.75	6.00	6.00
4.00	7.50	7.50	20.00	20.00	1¾ to 2 in.	2.00	3.75	3.75	10.00	10.00
7.00	10.00	10.00	30.00	30.00	2¼ to 2½ in.	3.50	5.00	5.00	15.00	15.00
10.00	14 00	14.00	39.00	39.00	2¾ to 3½ in.	5.00	6.50	6.50	19.50	19.50

LENGTH AND GAUGES OF STANDARD STEEL WIRE NAILS.

Sizes.	Length, inch.	Common.	Barbed Common.	Clinch.	Fence.	Common Brads.	Smooth & Barbed Finishing.	Fine.	Barrel.	Casing.	Smooth Box.	Barbed Box.	Flooring Brads.	Barb. Car L'ht	Barb. Car H'y	Slating.	Barbed Roofing.	Shingle.	Tobacco.	Lining.	Spikes.
....	¾	......	......	......	......	......	....	......	16	......	......	......	......	......	......	....	13	......	......	17	......
....	⅞	......	......	......	......	......	....	......	15	......	......	......	......	......	......	....	12	......	......	17	......
2d	1	16	15	14	......	16	17	17	15	16½	16½	16½	......	......	......	12	12	......	......	17	......
3dfi	1⅛	......	......	......	......	......	....	16½	15	......	......	......	......	......	......	....	....	......	......	......	......
3d	1¼	15½	14	13	......	15½	16½	......	14	16	16	16	......	......	......	11	11	......	......	......	......
....	1⅜	......	......	......	......	......	....	......	13	......	......	......	......	......	......	....	....	......	......	......	......
4d	1½	13½	13	12½	......	13½	16	16	13	15	15	15	......	12	10	11	10	......	12	......	......
5d	1¾	13	12	12½	10	13	15½	......	......	14	14	14	......	10	9	10	10	12½	12	......	......
6d	2	12½	12	11	10	12½	14	......	......	13½	13½	13½	11	10	9	....	9	12	11	......	......
7d	2¼	12	11	11	9	12	13½	......	......	13	13	13	11	9	8	....	....	11½	11	......	......
8d	2½	11½	11	10	9	11½	12½	......	......	12½	12½	12½	10	9	8	....	....	11	10	......	......
9d	2¾	11	10	10	8	11	12½	......	......	12	12	12	10	8	7	....	....	11	10	......	......
10d	3	10½	9	10	7	10½	12	......	......	11½	11½	11½	9	8	7	....	....	10	9	......	7
12d	3¼	9½	8	9	6	9½	11	......	......	11	11	11	8	7	6	....	....	......	......	......	......
16d	3½	8½	7	9	5	8½	10½	......	......	10	10	10	7	7	6	....	....	......	......	......	6
20d	4	6¾	6	8	4	6¾	10½	......	......	9½	9½	9½	......	6	5	....	....	......	......	......	5
30d	4½	6	5	......	......	6	....	......	......	9	9	9	......	6	5	....	....	......	Spikes.		4
40d	5	4½	4	......	......	4½	....	......	......	8	8	8	......	5	4	....	....	......	6½	1	3
50d	5½	3½	......	......	......	3½	....	......	......	......	......	......	......	4	3	....	....	......	7	0	2
60d	6	3	......	......	......	3	....	......	......	......	......	......	......	4	3	....	....	......	8	00	1
....	......	......	......	......	......	......	....	......	......	......	......	......	......	......	......	....	....	......	9	00	......

AWARDED A DIPLOMA BY THE AMERICAN INSTITUTE, NEW YORK.

AWARDED A BRONZE MEDAL BY THE SYDNEY EXPOSITION, AUSTRALIA.

IT SAVES MONEY, TIME, LABOR AND NAILS.

THE GIANT NAIL-PULLER AND BOX-OPENER.

NO MERCHANT, CARPENTER, PLUMBER, OR FARMER
CAN AFFORD TO BE WITHOUT ONE.
IT PAYS FOR ITSELF.

ASK ANY ONE OF THE THOUSANDS WHO USE THEM.

MANUFACTURED BY
MALTBY, HENLY & CO.

FOR SALE BY
ALL HARDWARE DEALERS

STANDARD STEEL WIRE NAILS.

SIZES, LENGTH AND NUMBER TO THE POUND.

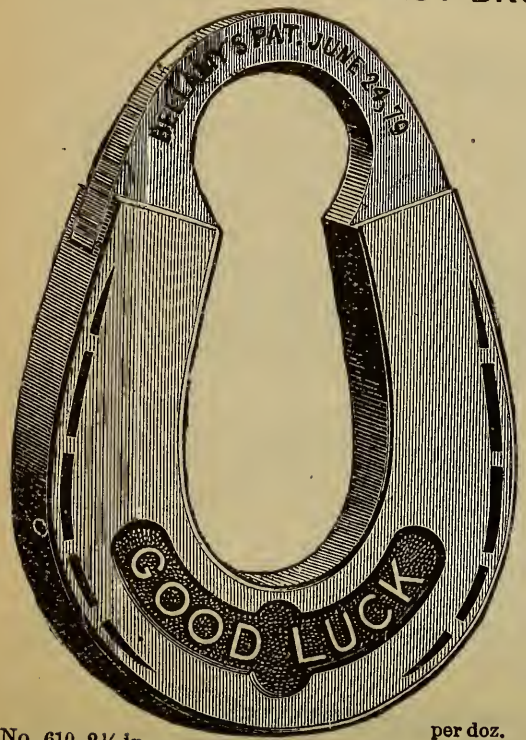
SIZES.	Length.	Common.	Barbed Common.	Clinch.	Fence.	Finishing	Barbed Finishing	Fine.	Barrel.	Casing.	Smooth Box.	Barbed Box.	Flooring Brads.	Barbed Oval-Head Car Nail. Light.	Barbed Oval-Head Car Nail. Heavy.	Slating.	Barbed Roofing.	Shingle.	Tobacco.	Lining.	Wire Spikes.	Length.	SIZES.
	¾ in	....	....	...	....	....	....	.. .	1500	....	....	....	....	.....	.....	....	714	....	....	2100	....	¾ in	
	⅞ "	....	....	....	....	....	....	....	1000	....	....	....	...	.....	.....	....	469	....	...	1780	...	⅞ "	
2d.....	1 "	1200	876	710	....	1558	1558	1550	875	1350	1350	1143	....	.....	.....	411	411	....	....	1500	....	1 "	2d
3d Fine	1⅛ "	....	....	....	....	....	....	1140	775	....	....	....	....	.....	.....	....	....	....	....	....	....	1⅛ "	3d Fine
3d Com	1¼ "	720	568	429	....	980	913	....	560	913	913	885	....	.....	... .	329	251	....	....	....	....	1¼ "	3d Com.
	1⅜ "	....	....	....	....	....	....	....	390	....	....	....	. ..	.....	.....	....	....	....	....	..	....	1⅜ "	
4d.....	1½ "	432	357	274	....	760	584	760	350	584	584	530	....	274	165	209	165	....	274	....	....	1½ "	.....4d
5d.....	1¾ "	300	235	235	142	575	410	....	....	410	410	406	....	142	118	142	142	270	235	....	....	1¾ "	.....5d
6d.....	2 "	252	204	157	124	350	268	...	....	310	310	299	157	124	103	....	103	204	157	....	....	2 "	.....6d
7d.....	2¼ "	186	139	139	92	275	238	....	....	238	238	210	139	92	76	....	....	182	139	....	....	2¼ "	.....7d
8d.....	2½ "	132	99	99	82	190	164	....	....	170	170	170	99	82	69	....	....	125	99	...	....	2½ "	.....8d
9d.....	2¾ "	105	90	90	62	173	149	. ..	....	150	150	147	90	62	54	....	....	114	90	...	....	2¾ "	.....9d
10d.....	3 "	87	69	83	50	137	105	....	.. .	121	121	121	69	57	50	....	....	83	69	....	50	3 "	.... 10d
12d....	3¼ "	66	53	64	38	98	97	....	....	97	97	94	53	47	38	....	....	....	....	....	....	3¼ "	.... 12d
16d.....	3½ "	51	43	59	30	81	71	....	....	72	72	72	43	43	35	. ..	....	....	....	....	35	3½ "	.... 16d
20d.....	4 "	35	31	43	23	71	54	....	....	54	54	53	....	31	26	....	....	....	....	....	26	4 "	.... 20d
30d.....	4½ "	27	24	....	....	....	....	....	....	46	46	44	....	28	24	....	....	....	....	....	20	4½ "	.... 30d
40d.....	5 "	21	18	....	....	....	....	....	....	36	36	36	....	21	18	....	....	....	....	....	15	5 "	.... 40d
50d.....	5½ "	15	....	....	....	....	....	....	....	. ..	....	....	....	17	14	....	....	....	....	....	12	5½ "	.... 50d
60d.....	6 "	12	....	....	....	....	...	....	....	....	....	....	....	15	13	....	....	....	....	....	10	6 "	.... 60d
	6½ "																				9	6½ "	
	7 "																				7	7 "	
	8 "																				5	8 "	
	9 "																				4½	9 "	

3⅜ lbs. of 4d Common, or 2⅔ lbs. of 3d Common, will lay 1000 shingles.

3¾ lbs. of 3d Fine will put on 1000 laths, 4 nails to the lath.

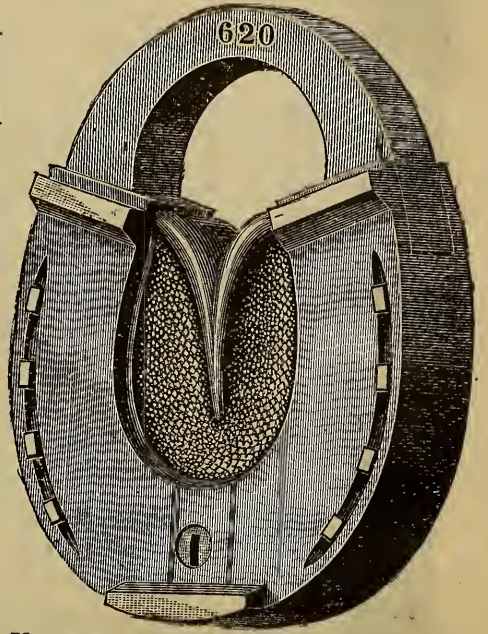
"HORSE SHOE" AND "HORSE HOOF" PADLOCKS.

CAST BRONZE LOCKS. 2 FLAT STEEL KEYS EACH.



We claim for these Padlocks beauty of design, weight, strength, safety and durability. They are thoroughly and carefully constructed, and finely finished. The three closely racked tumblers allow them a great variety of changes. Flat Steel Keys that turn either way. Shackle is held open after being thrown out by the Key. We use in them the celebrated PHOSPHOR BRONZE spring wire, which is VERY ELASTIC, and will not BREAK.

CUTS ALL FULL SIZE.



No. 620—Showing Shoe and Frog.

	per doz.
No. 610, 2½ in.	$9.00
Extra Keys to Lock, or Sample Key,	$1.80
Key Blanks,	90

	per doz.
No. 620, Plain Locks, 3 Tumblers,	$13.80
No. 622, Chain " 3 "	16.00
Extra Keys to Lock, or Sample Key.	$2.40
Key Blanks,	1.08

SISE, GIBSON & CO., Agents,
100 CHAMBERS STREET. NEW YORK.

APPROXIMATE NUMBER OF WIRE NAILS PER POUND.

WIRE GAUGE.	DIAM. W. & M.	APPROXIMATE SIZE.	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2	5	6	7	8
	Inches.	*Inches.*																								
00	.331	11/32 scant.	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	27	23	20	18	16	15	14	12	10	9	8	7	6	5
0	.307	5/16 full.	.....	.....	.....	.....	.....	.....	.....	.....	.....	34	29	25	21	19	17	16	15	13	11	10	9	8	7	5½
1	.283	9/32 scant.	.....	.....	.....	.....	.....	.....	.....	57	50	45	38	32	28	25	23	21	19	16	14	13	11	10	8	7
2	.263	1/4 full.	.....	.....	.....	.....	.....	.....	.....	65	58	52	44	37	32	29	26	24	22	19	16	14	13	11	9	8
3	.244	1/4 scant.	.....	.....	.....	.....	.....	100	87	76	67	60	50	43	38	34	30	28	25	22	19	17	15	13	11	10
4	.225	7/32 full.	.....	.....	.....	.....	.....	120	103	90	80	72	60	51	45	40	36	33	30	26	23	20	18	15	13	11
5	.207	1/5	.....	.....	.....	211	169	141	121	106	94	85	71	60	53	47	42	39	35	30	26	24	21	18	15	..
6	.192	3/16 full.	.....	.....	.....	247	197	164	141	123	111	99	82	71	62	55	50	45	41	35	31	28	25	21	18	..
7	.177	1/6	.....	.....	.....	299	239	200	171	149	133	120	100	85	75	67	60	54	50	43	37	33	30	25	..	..
8	.162	5/32 full.	.....	.....	.....	345	275	229	197	172	153	137	115	98	86	76	69	62	57	49	43	39	35	29	..	..
9	.148	1/7	.....	.....	.....	414	331	276	236	207	184	165	138	118	103	92	82	75	69	59	52	46	41	..	..	..
10	.135	1/8 full.	.....	.....	663	496	397	333	283	248	220	198	165	142	124	110	99	90	83	71	62	55	50	..	..	..
11	.120	1/8 scant.	.....	.....	837	628	502	418	359	314	279	251	209	179	157	139	125	114	105	90	79	70	..	..	..	..
12	.105	1/10	.....	.....	1.096	822	658	548	469	411	365	329	274	235	205	182	164	149	137	117	103	..	..	..	..	..
13	.092	3/32	.....	.....	1.429	1.072	857	714	613	536	476	429	357	306	268	238	214	195	178	153	...	..	..	..	..	..
14	.080	1/12	.....	2.840	1.893	1.420	1.136	947	811	710	631	568	473	406	350	315	284	258	236	..	..	..	..	..	..	.
15	.072	1/14	.....	3.504	2.336	1.752	1.402	1.168	1.001	876	778	701	584	500	438	389	350	...	..	..	..	..	..	..	..	..
16	.063	1/16	.....	4.571	3.048	2.282	1.828	1.523	1 305	1.143	1.015	913	761	653	571	508	...	...	...	...	...	..	..	..	..	..
17	.054		.....	6.233	4.156	3.116	2.495	2.077	1.781	1.558	1.385	1.246	1.038	890	779	...	...	...	...	...	...	..	..	..	..	..
18	.047		.....	8.276	5.517	4.138	3.310	2.758	2.364	2.069	1.839	1.655	1.379	1.182	...	...	...	...	...	...	...	..	..	..	..	..
19	.041		.....	10.668	7.612	5.334	4.267	3.556	2.933	2.667	2.370	2.133	1.778	.....	...	...	...	...	...	...	...	..	..	..	..	..
20	.035	1/32 full.	20.000	15.000	10.000	7.500	6.000	5.000	4.400	2.750	3.333	3.000	.....	.....	...	...	...	...	...	...	...	..	..	..	..	..
21			23.702	17.777	11.850	8.888	7.111	5.926	5.079	4.444	.....	.....	.....	.....	...	...	...	...	...	...	...	..	..	..	..	..
22			30.476	22.856	15.227	11.428	9.143	7.618	.....	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	..	..	..	..	..

This Table is an *Average* only, and the figures given may be varied slightly either way, by changes in the dimensions of the heads or points.

Wires of Various Metals Compared.

The following table is given by Mr. David Kirkaldy, of London, to exhibit the tensile strength and resistance to tension of wire made of various materials.

Specimens Tested.	Pulling Stress per square inch	
	Hard. Pounds.	Annealed. Pounds.
Copper	63.122	37.002
Brass	81.156	51.550
Charcoal Iron	65.834	46.160
Coke Iron	65.321	61.294
Steel	120.976	74.637
Phosphor Bronze, No. 1	159.515	58.853
" " No. 2	151.119	64.569
" " No. 3	120 141	54.111
" " No. 4	120.90	53.371

Specimens Tested	Extension per cent.		No. twists in 5 inches.
	Annealed.	Hard.	Annealed.
Copper	34.1	86.8	96
Brass	36.5	14.7	57
Charcoal Iron	28.	48.	87
Coke Iron	17.	26.	44
Steel	10.9	*	79
Phosphor Bronze, No. 1	46.6	13.3	66
" " No. 2	42.8	15.8	60
" " No. 3	44.9	17.3	53
" " No. 4	42.4	13.	124

Of the eight pieces of steel tested three stood from 40 to 45 twists, and five stood from 1½ to 4 twists.

Relative Malleability of the Metals.

1. Gold.
2. Silver.
3. Copper.
4. Tin.
5. Platinum.
6. Lead.
7. Zinc.
8. Iron.

Specific Resistances of Metals.

Copper	1.00	Mercury	50.00	Brass Wire	3.88
Silver	.98	Palladium	5.50	German Silver Wire.	11.30
Gold	1.13	Platinum	6.78	Nickel Wire	7.70
Iron	5.63	Tin Wire	6.80	Calcium Wire	2.61
Lead	10.76	Zinc Wire	3.70	Aluminium Wire	1.75

List of Conductors and Non-Conductors,

In which each substance named conducts better than that which precedes it; the first being the best insulator; the last the best conductor

1. Dry Air.
2. Paraffine.
3. Hard Rubber.
4. Shellac.
5. India Rubber.
6. Gutta Percha.
7. Sulphur.
8. Glass.
9. Silk.
10. Dry Paper.
11. Porcelain.
12. Dry Wood.
13. Dry Ice.
14. Water.
15. Saline Solutions.
16. Acids.
17. Charcoal or Coke.
18. Mercury.
19. Lead.
20. Tin.
21. Iron.
22. Platinum.
23. Zinc.
24. Gold.
25. Copper.
26. Silver.

When a wire of small resistance and an insulator of great resistance are employed upon a line the highest excellence is secured, since the lower the resistance in the former the better is the transmission, and the higher the resistance in the latter the less the waste of the current.

Table of Iron, Steel, Copper and Brass Wire.

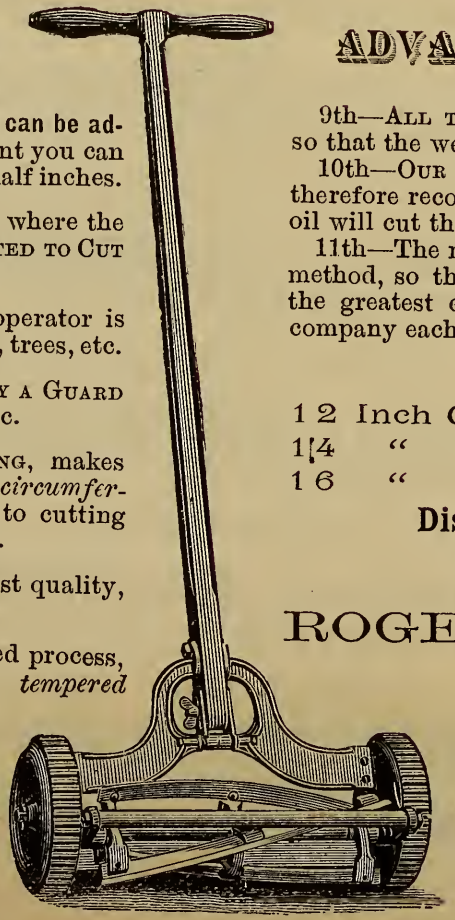
WEIGHT OF 100 FEET IN POUNDS. BIRMINGHAM WIRE GAUGE.

Brass and Copper Wire from 0 to 25 is numbered by Stubs' Gauge. Fine Wire from No. 26 is numbered by London Gauge.

No. of Gauge.	PER LINEAL FOOT.			
	Iron.	Steel.	Copper.	Brass.
0000	54 62	55 13	62 39	58 93
000	47 86	48 32	54 67	51 64
00	38 27	38 63	43 71	41 28
0	30 63	30 92	34 99	33 05
1	23 85	24 07	27 24	25 73
2	21 37	21 57	24 41	23 06
3	17 78	17 94	20 3	19 18
4	15 01	15 15	17 15	16 19
5	12 82	12 95	14 65	13 84
6	10 92	11 02	12 47	11 78
7	8 586	8 667	9 807	9 263
8	7 214	7 283	8 241	7 783
9	5 805	5 859	6 63	6 262
10	4 758	4 803	5 435	5 133
11	3 816	3 852	4 359	4 117
12	3 148	3 178	3 596	3 397
13	2 392	2 414	2 723	2 58
14	1 826	1 843	2 085	1 969
15	1 374	1 387	1 569	1 482
16	1 119	1 13	1 279	1 208
17	8915	9	1 018	9618
18	6363	6423	7168	6864
19	4675	472	534	5043
20	3246	3277	3709	3502
21	2714	274	31	2929
22	2079	2098	2373	2241
23	1656	1672	1892	1788
24	1283	1295	1465	1384
25	106	107	1211	1144
26	0859	0867	0981	0926
27	0678	0685	0775	0732
28	0519	0524	0593	056
29	0448	0452	0511	0483
30	0382	0385	0436	0412
31	0265	0267	0303	0286
32	0215	0217	0245	0231
33	017	0171	0194	0183
34	013	0131	0148	014
35	0066	0067	0076	0071
36	0042	0042	0048	0046

THE SUPERIOR LAWN MOWER.

SOME SPECIAL ADVANTAGES.



1st—The ease and quickness with which it can be adjusted to cut High and Low grass; in a moment you can vary the cut from one-half to three and one-half inches.

2d—It is the only Mower in the market where the same machine CAN, IN A MOMENT, BE ADJUSTED TO CUT grass from ONE TO TWELVE INCHES high.

3d—Being a FRONT-CUT MACHINE the operator is enabled to cut grass close up to walls, fences, trees, etc.

4th—The Reel Knives are PROTECTED BY A GUARD to prevent them from cutting shrubbery, etc.

5th—The ratchet or pawl has NO SPRING, makes scarcely any noise, *has eight catches in a circumference of three inches*, so that the reel starts to cutting the moment the machine is started forward.

6th—The material used is of the very best quality, so that BREAKAGES SELDOM IF EVER OCCUR.

7th—The KNIVES are made by a patented process, *of the best steel*, and are hardened and *tempered in oil.*

8th—They are made with the DOUBLE GEAR, giving it ease of motion, combined with strength, ENABLING ONE TO CUT GRASS RAPIDLY going at a slow rate of speed.

9th—ALL THE BEARINGS in the Mower ARE LONG, so that the wear will be very slow.

10th—OUR PAWLS WILL NOT GUM OR STICK; we therefore recommend to oil with machine oil. Coal oil will cut the bearings.

11th—The machine is sharpened by a very simple method, so that EVEN A CHILD CAN SHARPEN IT with the greatest ease. A Crank and full directions accompany each machine.

PRICE LIST:

12 Inch Cut, - - -	$13.00
14 " " - - - -	15.00
16 " " - - -	17.00

Discount to the Trade.

MANUFACTURED BY THE

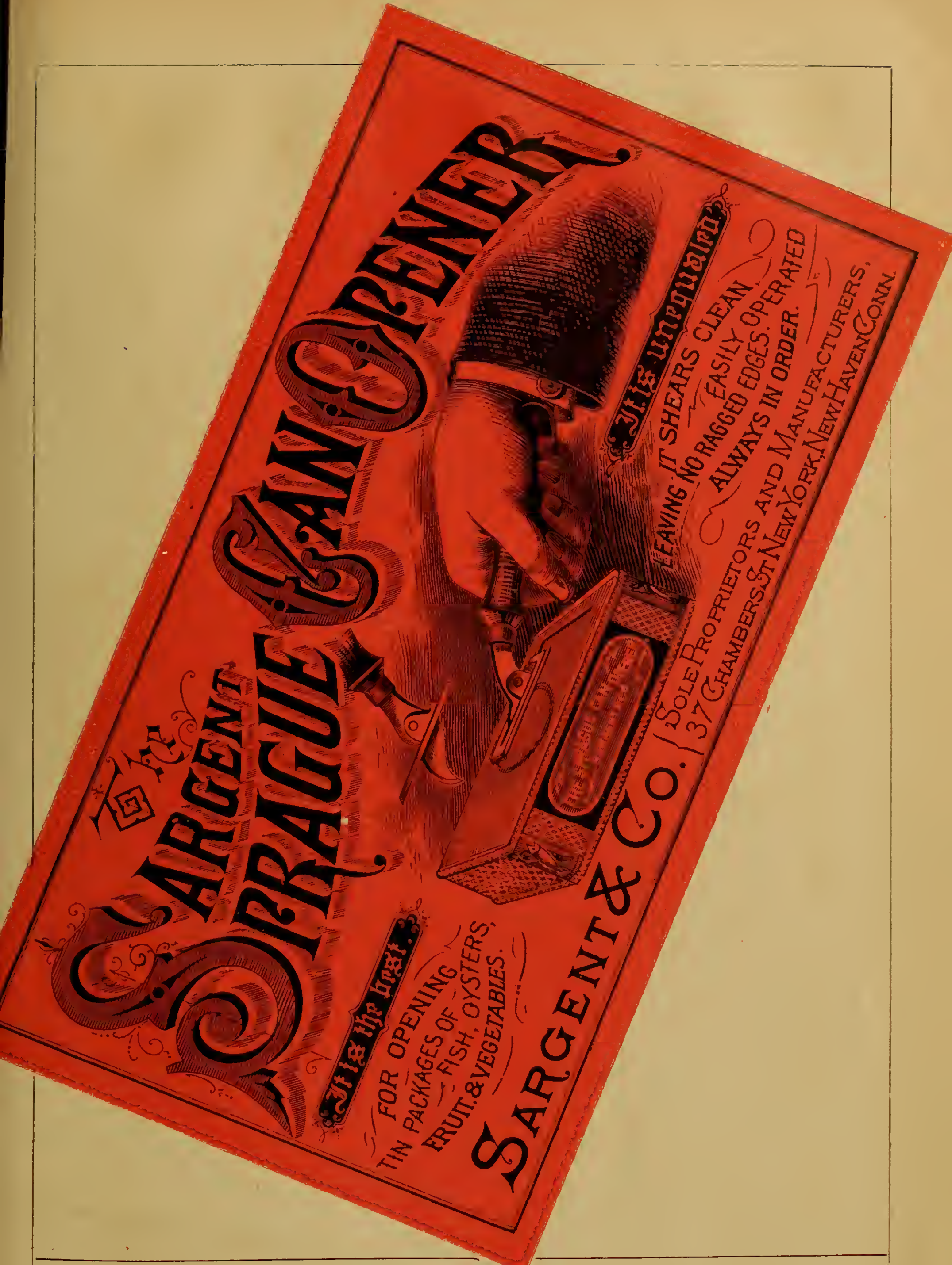
ROGERS FENCE CO.,

Springfield, Ohio.

Sole Agents for New York City,

Quackenbush, Townsend & Co.,

85 Chambers and
67 Reade Sts.

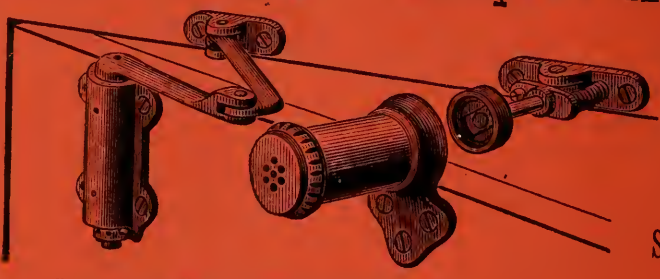


The **SARGENT-SPRAGUE CAN OPENER** is unequalled for opening tin cans of **ANY SHAPE OR SIZE.** The **DOUBLE FOOT** gives it a bearing on both sides of the knife, thus bringing the cutting edge in position to make a **CLEAN SHEAR CUT,** without leaving the tin torn or ragged; the double bearing also prevents an unequal strain upon the rivet, and insures durability with **RAPID** and **SATISFACTORY** work. Well made. Requires no adjusting. Always ready for use. **It is the best and most popular.**

DOOR SPRING AND CHECK.

Eclipse Spring. | **Eclipse Check.**

THIS will "Shut that Door."



THIS will "Stop that Slamming."

THE CUT SHOWS THE ECLIPSE DOOR SPRING AND CHECK APPLIED.

USE THE ECLIPSE DOOR SPRING AND CHECK.

The Eclipse Spring and Check are used in the counting room of this paper, and have been found to possess all the advantages claimed for them by the manufacturers. They not only close the door tightly, but do it so quietly that persons of the most nervous temperament are not annoyed. This little invention is especially useful in homes, and when placed on the doors leading from the kitchen it keeps them closed, thus preventing the odor which arises from cooking from permeating the house.

—*New York Journal of Commerce.*

BUY THE ECLIPSE.

THE ECLIPSE DOOR SPRING

Is the best ever offered, because:

The greatest power, exerted when the door is closed, gradually decreases as the door opens.

Tension of spring is adjustable.

Spring is out of sight, and is of extra heavy steel of the best quality, oil tempered.

The parts are interchangeable, so that in case of breakage any part can be replaced.

THE ECLIPSE DOOR CHECK

Prevents doors from slamming.

Can be placed on any door

Allows the door to open wide.

The parts are interchangeable, so that in case of breakage any part can be replaced.

For Sale by all well regulated Hardware Dealers the World over.

Manufactured by SARGENT & CO.

TABLE OF WEIGHTS,

Showing Estimated Number of Pounds of Barbed Wire Required to Fence Space or Distances Mentioned, with. One, Two or Three Strands.

	1 Strand.	2 Strands.	3 Strands.
1 Square Acre.....	57.5 lbs.	115 lbs.	172 lbs.
1 Side of a Square Acre.	15¼ "	28⅛ "	42¾ "
1 Square Half-Acre....	40½ "	81 "	121½ "
1 Square Mile.....	1440 "	2880 "	4320 "
1 Side of 1 Square Mile.	360 "	720 "	1080 "
1 Rod in Length.....	1⅛ "	2¼ "	3⅜ "
100 Rods in Length.....	112½ "	225 "	337½ "
100 Feet in Length.....	7 "	14 "	21 "

When Posts are placed apart.	There are required for each strand of wire, for one mile of fence...			Total cost of 1 mile of fence when posts cost 12½c. each, and wire and staples cost 7¾c. lb. for galvanized.	
Feet	Posts.	Lbs. of Staples	Lbs. of Wire.	3 Strands.	4 Strands.
8	660	7¼	360	$167 90	$196 35
10	528	5¾	360	149 00	180 39
12	440	4¾	360	139 78	168 07
16½	320	3½	360	124 45	152 68
20	264	3	360	117 40	145 53
25	212	2¼	360	110 74	138 80
30	176	2	360	106 16	134 22
33	160	1¾	360	104 09	132 15

Number of Wires and Distances Between Posts.

Although fences are sometimes made of *two* wires, to fence against cattle only, experts recommend no less than *three*, and as many more as desirable. *Five* wires make a good fence—such is used by nearly all the railroad companies.

The following are the distances apart at which the wires are generally placed:

Two-wire fence, 1st wire 22 inches, 2d wire 44 inches from the ground.

Three-wire fence, 1st wire 16 inches, 2d wire 30 inches, 3d wire 48 inches from the ground.

Four-wire fence, 1st wire 12 inches, 2d wire 24 inches, 3d wire 36 inches, 4th wire 48 inches from the ground.

Five-wire fence, 1st wire 8 inches, 2d wire 15 inches, 3d wire 24 inches, 4th wire 36 inches, 5th wire 48 inches from the ground.

One less strand may be used with *four-point* than two-point wire.

The HEIGHT OF THE LEGAL FENCE varies as follows:

Four feet high in Maine, New Hampshire, Massachusetts, Delaware and Idaho.

Four and a half feet high in Vermont, Rhode Island, Connecticut, New York, New Jersey, Maryland, West Virginia, Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Tennessee, Kansas, Nebraska, Colorado, Oregon, Arizona, Nevada, Montana, Dakota and Utah.

Five feet in Pennsylvania, Virginia, Missouri, Kentucky, North Carolina, South Carolina, Georgia, Alabama, Florida, Mississippi, Texas, Arkansas, California, and Washington and Wyoming Territories.

Wire Standard Hoisting Ropes,

With 6 Strands of 19 Wires Each.

TRADE NUMBERS, SIZES, WEIGHT AND STRENGTH.

IRON.

Trade No.	Diameter in Inches.	Circumference in Inches.	Estimated Weight per Foot in Lbs.	Breaking Stress in Tons of 2000 Lbs.	Proper Work'g Load in Tons of 2000 Lbs.	Circumf'ence of Hemp Rope of equal strength.	Minim'm diameter of Drum or Sheave, in Ft.
1	2¼	7	7.75	74	15	15½	8
2	2	6¼	6.11	65	13	14½	7
3	1¾	5½	5.09	54	11	13	6½
4	1⅝	5	4.00	44	9	12	5
5	1½	4¾	3.55	39	8	11½	4¾
5½	1⅜	4¼	2.90	33	6½	10¼	4½
6	1¼	4	2.42	27	5½	9½	4
7	1⅛	3½	1.95	20	4	8	3½
8	1	3⅛	1.53	16	3	7	3
9	⅞	2¾	1.16	11.50	2½	6	2¾
10	¾	2⅜	0.85	8.64	1¾	5	2½
10¼	⅝	2	0.60	5.13	1¼	4½	2
10½	9/16	1¾	0.47	4.27	¾	4	1¾
10¾	½	1½	0.37	3.48	½	3½	1½
10⅞	⅜	1¼	0.26	2.50	¼	3	1

CRUCIBLE STEEL.

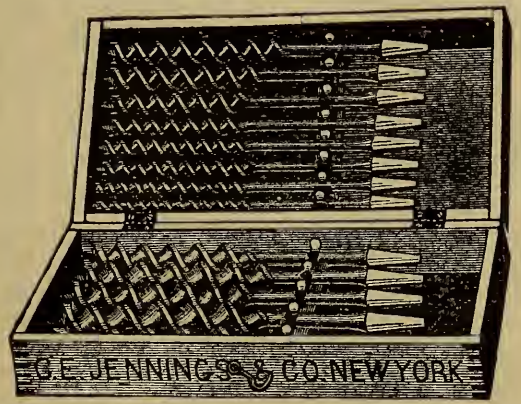
1	2¼	7	7.75	164.69	32.90		9
2	2	6¼	6.11	132.37	26.50		8
3	1¾	5½	5.09	108.13	21.63		7½
4	1⅝	5	4.00	97.17	19.44		6
5	1½	4¾	3.55	86.38	17.30	16½	5½
5½	1⅜	4¼	2.90	72.33	14.46	14	5¼
6	1¼	4	2.42	50.17	10.00	12¼	5
7	1⅛	3½	1.95	38.00	7.70	11	4½
8	1	3⅛	1.53	29.20	5.80	9	4
9	⅞	2¾	1.16	21.55	4.00	8	3¾
10	¾	2⅜	0.85	14.99	3.00	6½	3½
10¼	⅝	2	0.60	12.53	2.50	5¾	3
10½	9/16	1¾	0.47	8.81	1.75	5¼	2¾
10¾	½	1½	0.37	7.52	1.50	4¾	2

☞ The weights above stated are for Ropes with HEMP CENTERS. For Ropes made with WIRE CENTERS, add TEN PER CENT. to these weights. Also, see Table of GALVANIZED STRAND.

C. E. JENNINGS & CO.'S
EXTRA QUALITY AUGER BITS.

All our Auger Bits are made of Solid Cast Steel and Warranted.

This illustration represents our Auger Bits put up in fancy wood boxes with rack to hold one Auger Bit of each size.



No. 10 Set.—C. E. Jennings & Co.'s Extension Lip Auger Bits, 13 Bits, 32⅛ quarters, one each as follows: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16-16ths of an inch, per set..... $5 00

No. 30 Set.—C. E. Jennings & Co.'s Extra Double Spur Auger Bits, 13 Bits, 32⅛ quarters, per set..... $3 50

C. E. JENNINGS & CO.,
79 and 81 Reade and 97 Chambers Sts., New York.

MERRILL & WILDER'S
EXTRA SOCKET FIRMER CHISELS.

SOLID CAST STEEL.

These Tools are tempered by an improved process, insuring a Perfect Cutting Edge.

THIS CUT ILLUSTRATES A NO. 10 SET IN FANCY BOX.

CONDITIONS OF WARRANTY:

We warrant all goods bearing our trade mark to be perfect when they leave the shop, so far as the material and workmanship is concerned. If a tool proves too soft and bends on the edge or breaks in consequence of a flaw in the steel and is returned to the person from whom it is bought within 30 days from date of purchase, a new tool will be given in exchange. If it is broken where the steel is sound, it will not be exchanged.

Price, No. 10 set, 12 Chisels from ⅛ to 2 inches (sharpened and set ready for use), in fancy wooden box..... $6 00

C. E. JENNINGS & CO.,
79 and 81 Reade and 97 Chambers Sts., New York.

TABLE

SHOWING THE DIAMETER IN DECIMALS OF AN INCH, AND THE NUMBER OF FEET IN ONE POUND, OF EACH GAUGE IRON WIRE, AS DRAWN BY WASHBURN & MOEN WIRE GAUGE.

No.	Decimals of inch.	Feet in pound.	No.	Decimals of inch.	Feet in pound.
000	.362	2.873	15	.072	72.984
00	.331	3.444	16	.063	95.396
0	.323	3.619	17	.054	129.873
1	.283	4.698	18	.047	172.401
2	.263	5.444	19	.041	222.222
3	.244	6.333	20	.035	301.249
4	.225	7.460	21	.032	370.036
5	.207	8.809	22	.028	476.190
6	.192	10.270	23	.025	640.74
7	.177	12.047	24	.023	879.03
8	.162	14.365	25	.020	1189.71
9	.148	17.238	26	.018	1485.62
10	.135	20.698	27	.017	1872.71
11	.120	26.174	28	.016	2361.42
12	.105	34.254	29	.015	2978.91
13	.092	44.655	30	.014	3754.83
14	.080	59.174			

TABLE

SHOWING CORRESPONDING SIZES OF STUBS' STEEL WIRE OR RODS, TO THE DIVISIONS OF AN INCH.

Nos. 2	12	21	28	30	35	42	48	52	56	61
$\frac{14}{64}$	$\frac{12}{64}$	$\frac{10}{64}$	$\frac{9}{64}$	$\frac{8}{64}$	$\frac{7}{64}$	$\frac{6}{64}$	$\frac{5}{64}$	$\frac{4}{64}$	$\frac{3}{64}$	$\frac{2}{64}$

MESH OF COAL SCREENS

USED BY THE PRINCIPAL COAL DEALERS.

$2\frac{1}{2}$, $2\frac{1}{4}$ and 2 inch	Screens	Furnace Coal.
$1\frac{5}{8}$ and $1\frac{1}{2}$ "	"	Stove out of Egg Coal.
$1\frac{1}{4}$ and 1 "	"	Nut out of Stove.
$\frac{3}{4}$ and $\frac{5}{8}$ "	"	Stove Coal.
$\frac{1}{2}$ and $\frac{3}{8}$ "	"	Nut "
$\frac{1}{4}$ "	"	Pea "
$\frac{3}{16}$ "	"	Brickmakers' Dust.

MESH OF FANNING-MILL WIRE CLOTH.

The ordinary widths are 20, 21, 22 and 24 inch, and the Meshes for cleaning Seed are:

For Wheat	4x4 or 5x5
" Corn and Oats	2x2
" Rye	3x3
" Cockle	8x8 or 9x9
" Peas	2x4 or 2x5
" Clover	13x13 or 14x14
" Clover from Sand	20 or 22 Mesh
" Timothy	16x16, 18x18 or 20x20
" Cheat	2x9, 10 or 12, or 3x10, 11 or 12
" Flax	4x13, 4x14 or 4x16

BROWNING, SISUM & CO.,

No. 85 CHAMBERS STREET, NEW YORK.

MANUFACTURE

Hardware Specialties,

COTTER'S SPRING KEYS

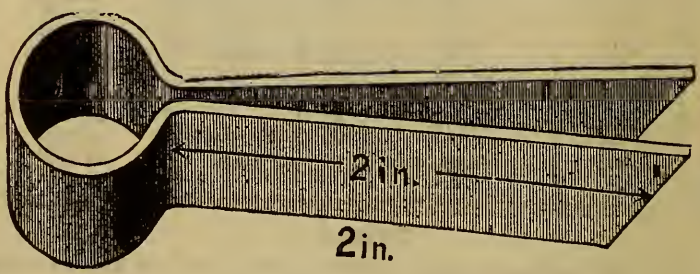
—AND—

MANUFACTURERS' SUPPLIES.

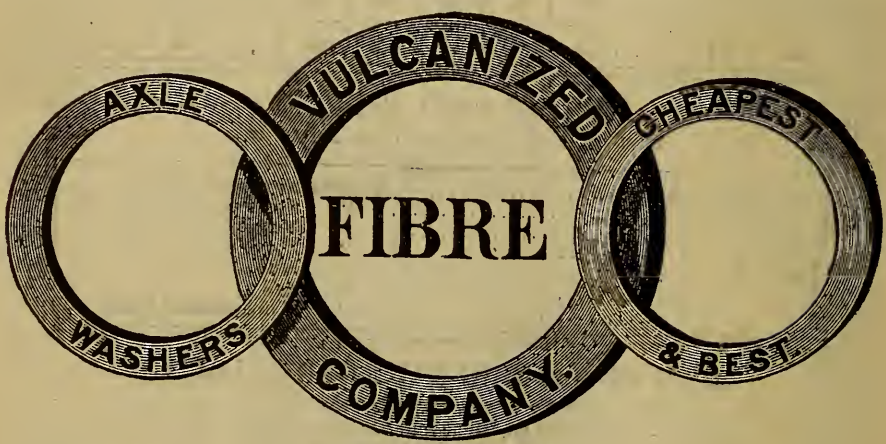
D Rings, Belt Hooks, Staples, etc.

In fact everything appertaining to

WIRE BENDING.



FACTORY, - BROOKLYN, N. Y.



FOR SALE BY

HARDWARE DEALERS EVERYWHERE.

Liberal Discounts to the Trade.

Send for Samples and Price-Lists,

FACTORY:
WILMINGTON, DEL.

NEW YORK OFFICE:
No. 14 DEY ST.

Spring Cotters and Keys and their Applications.

SPRING COTTERS.

No	30	31	32	33	34	35	36	37	39	39
Wire Gauge..	13	13	11	11	7	7	4	4	1	1
For Hole.....	$\frac{3}{32}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{16}$
For Nuts.....	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	1	1	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$

SPRING KEYS.

No	000	00	0	1	$1\frac{1}{2}$	2	3	4
Wire Gauge	12	12	12	11	11	10	10	10
For Hole	$\frac{7}{32}$	$\frac{7}{32}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{9}{32}$	$\frac{9}{32}$	$\frac{9}{32}$
For Bolts	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	1

Wire Bale Ties.

Nos. 16, 15, 14, 13 and 12 are put up in bundles of 250 Ties, Nos. 11, 10 and 9 wire are put up in bundles of 125 Ties and run in length from 6 feet to $11\frac{1}{4}$ feet.

Other Sizes and Lengths made to order as required.

To get length of Tie required, add three inches to the measure around the bale when under pressure.

SIZE AND LENGTH OF TIES IN GENERAL USE.

For 17×22 Perpetual Presses, use Ties 8, $8\frac{1}{2}$ or 9 feet long; No. 14 wire for heavy work, and No. 15 for light work.

For 14×18 Perpetual Presses, use Ties 8, $8\frac{1}{4}$ or $8\frac{1}{2}$ feet long; No. 14 wire for extra or extreme heavy work; No. 15 for heavy and medium work, and No. 16 for light work.

For 12×15 Perpetual Presses, use Ties $7\frac{1}{2}$, $7\frac{3}{4}$ or 8 feet long; No. 15 wire for heavy work, and No. 16 for medium or light work.

For Upright Hand Presses, use No. 14 or No. 15 wire.

For Upright Light Horse Presses, use No. 14 wire.

For Upright Heavy Portable or Light Stationary Horse Presses, use No. 13 wire.

For Upright Heavy Stationary and Beater Presses, use No. 12, No. 11 and No. 10 wire, according to the size of bale and number of Ties used.

For Broom Corn, Wool, Cotton, Hides, &c., or other materials put up in heavy bales, use No. 9, No. 10 or No. 11 wire.

BRUCE & COOK,

—IMPORTERS OF—

METALS.

TIN PLATE.
Roofing Plate,
Special Sizes,
Block & Bar Tin,
Tinners' Solder.

SHEET IRON.
Russia,
Pat. Planished,
Galvanized,
Double Seaming,
Cold Rolled,
Common.

WIRE.
Bright Iron,
Annealed Fence,
Coppered,
Galvanized,
Tinned.

SOLDER.
Ex. Wiping,
No. 1 Refined,
No. 1 Capping,
Ex. No. 1 "B. & C."
Half and Half.

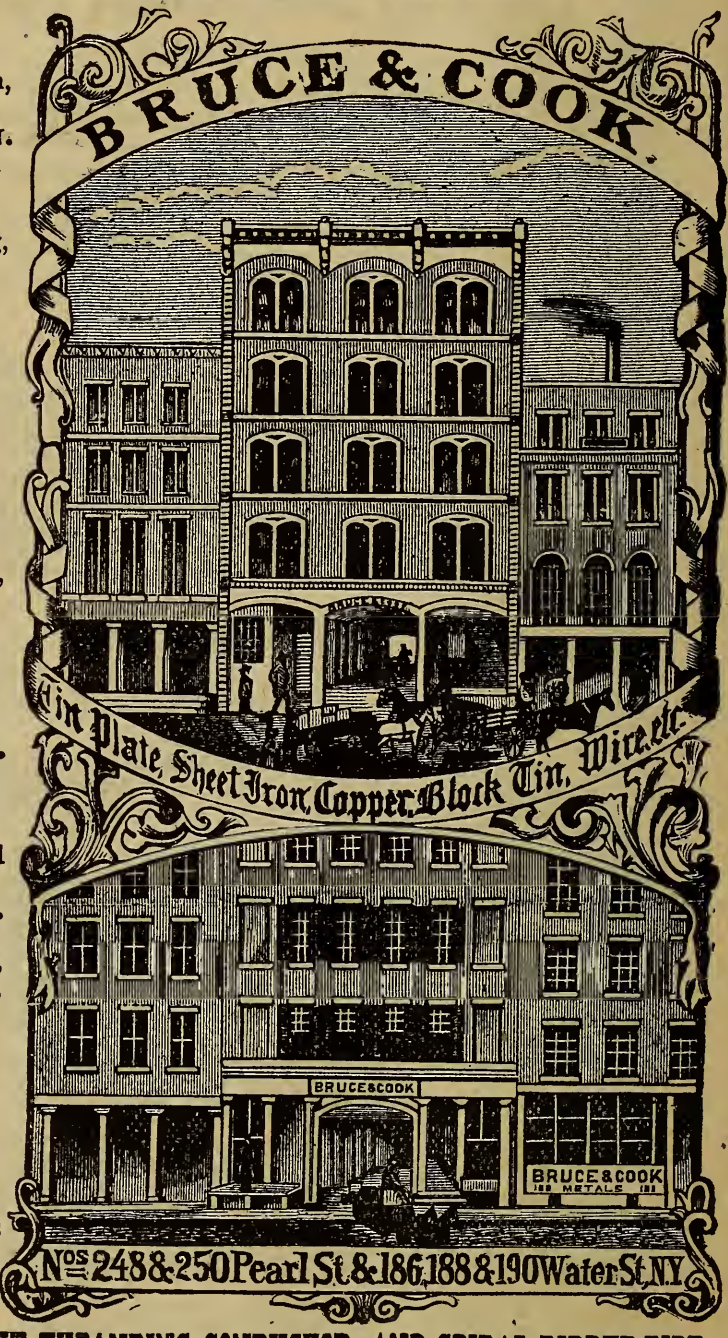
COPPER.
Sheet, Bottoms,
Solders, Bolts,
Wire, Ingot.

SHEET ZINC.
American,
Spelter.

ELBOWS.
Russia, Planished
Charcoal.

Stove Boards.
Stove Bolts,
" Pipe Collars,
" " Dampers,
Fire Pots,
Rivets, Black,
" Tinned,
Kettle Ears.

SUNDRIES.
Babbit Metal,
Antimony,
Spelter Solder,
Tinsmiths' Tools and Machines,
Milk Can Trimmings.



AUSTIN'S PATENT EXPANDING CONDUCTOR, AND SPIRAL RIBBED PIPE.

PATENT ROOFING SEAMER FOR PUTTING TIN TOGETHER.

All Latest and Best Machines for Roofers and Tinners.

We call special notice to our Retail Department for those wanting Tinmen's Supplies less than full packages. All orders promptly attended to. Write for prices.

Table of Standard or Regular Tin Plates.

Size and Kind of Plates—Number and Weight of Sheets in a Box, and Wire Gauge Thickness, of every Kind and Size.

Size.	Grade.	Sheets in Box.	Pounds in Box.	Wire Gauge.
10 by 10	IC	225	78	29
"	IX	225	98	27
"	IXX	225	112	26
"	IXXX	225	124	25
"	IXXXX	225	140	24½
10 by 14	IC	225	108	29
"	IX	225	136	27
"	IXX	225	159	26
"	IXXX	225	178	25
"	IXXXX	225	200	24½
10 by 20	IC	225	156	29
"	IX	225	196	27
11 by 11	IC	225	95	29
"	IX	225	118	27
"	IXX	225	135	26
11 by 15	SDC	200	164	26
"	SDX	200	185	25
"	SDXX	200	206	24½
"	SDXXX	200	226	24
"	SDXXXX	200	248	23
22 by 15	SDC	100	164	26
"	SDX	100	185	25
"	SDXX	100	206	24½
"	SDXXX	100	226	24
"	SDXXXX	100	248	23
12½ by 17	DC	100	96	28
"	DX	100	124	26
"	DXX	100	145	24
"	DXXX	100	166	23
"	DXXXX	100	185	22
15 by 21	DX	100	183	27
"	DXX	100	214	24
"	DXXX	100	245	23
"	DXXXX	100	276	22
25 by 17	DC	50	96	28
"	DX	50	124	26
"	DXX	50	145	24
"	DXXX	50	166	23
"	DXXXX	50	185	22
14 by 20	IC	112	108	29
"	IX	112	136	27
"	IXX	112	157	26
"	IXXX	112	178	25
"	IXXXX	112	200	24½
"	IXXXXXX	112	240	23½
12 by 12	IC	225	108	29
"	IX	225	136	27
"	IXX	225	157	26
"	IXXX	225	178	25

Size.	Grade.	Sheets in box.	Pounds in box.	Wire Gauge.
13 by 13	IC	225	130	29
"	IX	225	164	27
"	IXX	225	190	26
"	IXXX	225	216	25
14 by 14	IC	225	152	29
"	IX	225	192	27
"	IXX	225	221	26
"	IXXX	225	250	25
"	IXXXX	225	279	24½
15 by 15	IX	225	221	27
"	IXX	225	255	26
"	IXXX	225	288	25
"	IXXXX	225	322	24½
16 by 16	IC	225	200	29
"	IX	225	252	27
"	IXX	225	290	26
"	IXXX	225	328	25
"	IXXXX	225	368	24½
17 by 17	IX	112	140	27
"	IXX	112	162	26
"	IXXX	112	184	25
"	IXXXX	112	205	24½
18 by 18	IX	112	158	27
"	IXX	112	182	26
"	IXXX	112	206	25
"	IXXXX	112	231	24½
22 by 22	IXX	56	135	26
"	IXXX	56	...	25
"	IXXXX	56	...	24½
24 by 24	IXX	56	157	26
"	IXXX	56	...	25
"	IXXXX	56	...	24½

Terne Plates.

14 by 20	IC	112	108	29
"	IX	112	136	27
20 by 28	IC	112	216	29
"	IX	112	272	27
20 by 200	IC	....	172	29
"	IX	....	216	27

Tin Taggers.

10 by 14		450	108	38

Black Taggers.

10 by 14		256	108	32
"		300	108	34
"		360	108	36
"		450	108	38

From the "Metal Worker."

Cost of Tin Roofing.

The following table shows the cost per square and per square foot of tin roofing, laid with 14x20 tin, with tin at any price from $4 to $10 per box. The first column contains the price per box of tin; the second column shows the cost of tin per square (100 square feet) of surface, and the third column shows the cost of tin per square foot of surface:

FLAT SEAM ROOFING—COST WITH 14x20 TIN.

Price of tin per box.	Cost per square of flat roof 14x20 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of flat roof 14x20 tin.	Cost per sq. foot.
$4.25	$2.21	.0221	$8.25	$4.29	.0429
4.50	2.34	.0234	8.50	4.42	.0442
4.75	2.47	.0247	8.75	4.55	.0455
5.00	2.60	.0260	9.00	4.68	.0468
5.25	2.73	.0273	9.25	4.81	.0481
5.50	2.86	.0286	9.50	4.94	.0494
5.75	2.99	.0299	9.75	5.07	.0507
6.00	3.12	.0312	10.00	5.20	.0520
6.25	3.25	.0325	10.25	5.33	.0533
6.50	3.38	.0338	10.50	5.46	.0546
6.75	3.51	.0351	10.75	5.59	.0559
7.00	3.64	.0364	11.00	5.72	.0572
7.25	3.77	.0377	11.25	5.85	.0585
7.50	3.90	.0390	11.50	5.98	.0598
7.75	4.03	.0403	11.75	6.11	.0611
8.00	4.16	.0416	12.00	6.24	.0624

STANDING SEAM ROOFING—COST WITH 14x20 TIN.

Price of tin per box.	Cost per square of standing seam roof with 14x20 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of standing seam roof with 14x20 tin.	Cost per sq. foot.
$4.25	$2.37	.0237	$7.25	$4.03	.0403
4.50	2.51	.0251	7.50	4.17	.0417
4.75	2.65	.0265	7.75	4.31	.0431
5 00	2.79	.0279	8.00	4.45	.0445
5.25	2.93	.0293	8.25	4.59	.0459
5.50	3.06	.0306	8.50	4.73	.0473
5.75	3.20	.0320	8.75	4.87	.0487
6.00	3.34	.0334	9.00	5.01	.0501
6.25	3.48	.0348	9.25	5.15	.0515
6.50	3.62	.0362	9.50	5.29	.0529
6.75	3.76	.0376	9.75	5.43	.0543
7.00	3.90	.0390	10.00	5.57	.0557

Cost of Tin Roofing—Continued.

The following table shows the cost per square and per square foot of tin roofing, laid with 20x28 tin, with tin at any price from $8 to $24 per box. The first column contains the price per box of tin; the second column shows the cost of tin per square (100 square feet) of surface, and the third column shows the cost of tin per square foot of surface.

FLAT SEAM ROOFING—COST WITH 20x28 TIN.

Price of tin per box.	Cost per square of flat seam roof 20x28 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of flat seam roof 20x28 tin.	Cost per sq. foot.
$8.00	$2.01	.0201	$16.00	$4.01	.0401
8.50	2.13	.0213	16.50	4.13	.0413
9.00	2.26	.0226	17.00	4.26	.0426
9.50	2.38	.0238	17.50	4.38	.0438
10.00	2.51	.0251	18.00	4.51	.0451
10.50	2.63	.0263	18.50	4.63	.0463
11.00	2.76	.0276	19.00	4.76	.0476
11.50	2.88	.0288	19.50	4.88	.0488
12.00	3.00	.0300	20.00	5.01	.0501
12.50	3.13	.0313	20.50	5.13	.0513
13.00	3.25	.0325	21.00	5.26	.0526
13.50	3.38	.0338	21.50	5.38	.0538
14.00	3.50	.0350	22.00	5.51	.0551
14.50	3.63	.0363	22.50	5.63	.0563
15.00	3.75	.0375	23.00	5.76	.0576
15.50	3.88	.0388			

STANDING SEAM ROOFING—COST WITH 20x28 TIN.

Price of tin per box.	Cost per square of standing seam roof with 20x28 tin.	Cost per sq. foot.	Price of tin per box.	Cost per square of standing seam roof with 20x28 tin.	Cost per sq. foot.
$8.00	$2.15	.0215	$16.50	$4.42	.0442
8.50	2.28	.0228	17.00	4.56	.0456
9 00	2.41	.0241	17.50	4.69	.0469
9.50	2.55	.0255	18.00	4.82	.0482
10.00	2.68	.0268	18.50	4.96	.0496
10.50	2.82	.0282	19.00	5.09	.0509
11.00	2.95	.0295	19.50	5.23	.0523
11.50	3.09	.0309	20.00	5.36	.0536
12.00	3.21	.0321	20.50	5.49	.0549
12.50	3.35	.0335	21.00	5.63	.0563
13 00	3.48	.0348	21.50	5.76	.0576
13.50	3.62	.0362	22.00	5.90	.0590
14.00	3 75	.0375	22.50	6.03	.0603
14.50	3.89	.0389	23.00	6.17	.0617
15.00	4.02	.0402	23.50	6.30	.0630
15.50	4.15	.0415	24.00	6.43	.0643
16.00	4.29	.0429			

RECIPES FOR SOLDERS.

SOFT SOLDERS.

Among the soft solders to be employed with metals melting at a low temperature, we give the following:

Solder for bright tin ware, etc.: "Half & Half."

Tin	50 parts.
Lead	50 "

Solder for roofing, and plumbing joints: "No. 1."

Tin	40 parts.
Lead	60 "

Solder for galvanized ware, etc.: "No. 1. Extra."

Tin	45 parts.
Lead	55 "

Solder for pewter:

Tin	100 parts.
Lead	200 "

Solder for sealing iron in stone:

Lead	200 parts.
Zinc	100 "

This alloy is more resisting and adheres better than pure lead.

Solders for obtaining casts of medals, coins, etc.:

Bismuth	400 or 600
Lead	200 " 200
Tin	200 " 300

This alloy melts between 212 F. (or at water-boiling point) and becomes very liquid.

HARD SOLDERS.

Above we give the alloys of all soft solders. Herewith we give the constituents and process of making the harder ones:

Solder for iron:

Copper	67
Zinc	33

Solder for pure copper or ordinary brass:

Copper	3
Zinc	1

Solder for hard brass:

Scraps of metal to be soldered	4
Zinc	1

Hard solder for small and thin pieces:

Copper	86.5
Zinc	4.5

Solder for uniting brass tube seams:

Copper... 70 Tin..... 30	Brass	77.5
	Zinc	22.5

The proper process of making these solders is as follows: The copper and zinc are melted in separate crucibles, then added together in a pouring-pot and thoroughly mixed, and when at the proper temperature is poured from a certain height upon a bundle of birch twigs, kept wet and agitated at the surface of a tub of water. The solder is thus obtained in the shape of fine grains, having an irregular crystallization. When solder is not sufficiently fine it is hammered in a cast-iron mortar and passed through a sieve.

STOVE BOARDS.

THE THREE BEST THAT CAN BE MADE.

WOOD-LINED AND PAPER-LINED.

THE DAISY

Is Made of Embossed White Metal,

Perfect in Make and Finish,

Beautiful and Durable.

THE NEW TACOMA

IS AN EMBOSSED METAL BOARD.

FIRE-PROOF AND BRASS-FINISHED.

THE FAVORITE

Is the Best ZINC BOARD Made. Oil Finished and a Durable Silver Polish. Prices Reasonable. Send for Price-Lists and Discounts. Sold by Jobbers in all Large Towns.

MADE ONLY BY

A. I. GRIGGS

211 Water Street, New York.

P. S.—He makes a Metal "Slop-Jar Mat" that should be under every slop-jar in use.

Table of Weights of Sheet Copper per Square Foot, and Thickness per English Wire Gauge.

English Wire Gauge.	Weight per sq. foot.		Weight of Each Sheet.				
			14x18	24x48	30x60	36x72	48x72
	lbs.	oz.	lbs.	lbs.	lbs.	lbs.	lbs.
No. 1	14	8	.....	116	181	261	348
2	13	14	.....	111	174	250	334
3	12	12	.....	102	159	230	306
4	11	9	.....	93	145	209	278
5	10	1	.....	81	126	182	242
6	9	6	.....	75	118	169	226
7	8	11	.....	70	109	157	209
8	7	14	.....	63	99	142	190
9	7	3	.....	58	90	130	173
10	6	8	.....	48	81	117	156
11	5	12	.....	46	73	104	139
12	5	1	.....	41	64	91	122
13	4	5	.....	35	54	78	104
14	3	9	.....	29	45	65	86
15	3	4	.....	26	41	59	78
16	2	14	.....	23	36	52	70
17	2	8	.....	20	32	45	60
18	2	2	.....	18	27	39	52
19	1	15	.....	16	24	35	47
20	1	12	.....	14	22	32	43
21	1	9	.....	13	20	29	39
22		22	$6\frac{1}{2}$	12	18	26	35
23		20	$5\frac{7}{8}$	10	16	23	31
24		18	$5\frac{1}{4}$	9	15	21	28
25		16	$4\frac{5}{8}$	8	$12\frac{1}{2}$	19	25
26		14	4	7	11	15	21
27		12	$3\frac{1}{2}$	6	$9\frac{3}{8}$	13	18
28		10	3	5	7	11	15

WEIGHT OF SHEET COPPER PER SQUARE FOOT.

$\frac{1}{16}$ inch Thick Weighs ..... 3 lbs to the square foot.
$\frac{1}{8}$ " " " ..... 6 " " " " "
$\frac{1}{4}$ " " " .....12 " " " " "
$\frac{1}{2}$ " " " .....24 " " " " "

Planished Copper—Boiler Size.

Wire Gauge.	Size of Sheet.	Weight of Sheets	
		Pounds.	Ounces.
6	14x49	3	14
7	14x52	4	
8	14x57	5	2
9	14x60	5	9
14	14x48	4	
16	14x48	4	4

Gutter Copper—20x72 Inches.

Thickness Wire Gauge.	Thickness of 30x60 sheet.		Sheet of same thickness 20x72.	
	No.	Lbs.	Size.	Lbs.	Ozs.
27	10	30x60	9	2
24	12	30x60	10	8
23	14	30x60	13	2

See Copper Sheathing Sheets.

SPUN BRASS KETTLES,

WEIGHT AND CAPACITY OF.

7 in.....	1 lb.....	½ gal	18 in.....	10½ lb.....	10 gal
8 "	1½ "	1 "	19 "	12½ "	12 "
9 "	2½ "	1½ "	20 "	16½ "	14 "
10 "	3 "	2 "	21 "	18 "	17 "
11 "	3½ "	2½ "	22 "	20 "	18 "
12 "	4 "	3 "	23 "	23 "	23 "
13 "	5 "	4 "	24 "	27½ "	25 "
14 "	5¾ "	4½ "	25 "	29 "	30 "
15 "	6½ "	5 "	26 "	32 "	32 "
16 "	7½ "	6 "	27 "	37 "	37 "
17 "	9 "	8 "	28 "	40 "	42 "

Number of Copper Belt Rivets and Burs in one Pound.

Inch....	¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1	1⅛	1¼	1½	Burs
No. 7...	272	250	228	180	164	160	148	112	116	100	84	80	69	345
" 8...	276	248	208	200	178	172	152	136	110	104	96			390
" 9...	340	280	272	248	228	220	184	176	156	136				610
" 10..	544	448	384	340	304	300	272	238	204					716
" 12...	588	512	452	404	354	334	304	272						985
" 13...	996	852	532											1630

Copper Hose Rivets and Burs.

Size.....	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	Burs.
No. 7....			155	142	133	122	109	97	345
" 8....	308	201	181	160	150	135	116	100	390

Copper Oval Head (or Trunk) Rivets and Burs.

	¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1	1⅛	1¼	Burs
No. 9.....	320	285	259	243	219	199	177	159	137	123	113	104	610

Number of Copper Braziers' Rivets in one Pound.

Nos.....	0	1	2	3	4	5	6	7	8	9	10
	148	100	70	44	34	24	18	12	9	6	4

Bar and Sheet Brass.

WEIGHT IN POUNDS.

Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.	Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.
1-16	2.7	.015	.011	1 1-16	45.95	4.07	3.20
⅛	5.41	.055	.045	⅛	49.69	4.55	3.57
3-16	8.12	.125	.1	3-16	51.4	5.08	3.97
¼	10.76	.225	.175	¼	54.18	5.65	4.41
5-16	13.47	.350	.275	5-16	56.85	6.22	4.86
⅜	16.25	.51	.395	⅜	59.55	6.31	5.35
7-16	19.	.69	.54	7-16	62.25	7.45	5.85
½	21.65	.905	.71	½	65.	8.13	6.37
9-16	24.3	1.15	.9	9-16	57.75	8.83	6.92
⅝	27.12	1.4	1.1	⅝	70.35	9.55	7.48
11-16	29.77	1.72	1.35	11-16	73.	10.27	8.05
¾	32.46	2.05	1.60	¾	75.86	11.	8.65
13-16	35.18	2.4	1.85	13-16	78.52	11.82	9.29
⅞	37.85	2.75	2.15	⅞	71.25	72.68	9.95
15-16	40.55	3.15	2.48	15-16	84.	13.5	10.58
1	43.29	3.65	2.85	2	86.75	14.35	11.25

Bar and Sheet Copper.

Weight in Pounds.

Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.	Thickness, or Diameter, or Size; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.
1-16	2.88	.015	.011	1 1-16	49.	4.35	3.41
⅛	5.75	.06	.056	⅛	52.	4.86	3 85
3-16	8.65	.134	.105	3-16	54.9	5.40	4.29
¼	11.48	.235	.187	¼	57.65	6.	4.73
5-16	14.36	.375	.295	5-16	60.5	6.60	5.20
⅜	17.23	.54	.424	⅜	53.45	7.27	5.70
7-16	20.19	.735	.575	7-16	66.35	7.90	6.28
½	23.1	.960	.75	½	69.3	8.64	6.80
9-16	26.	1.21	.95	9-16	72.15	9.28	7.30
⅝	28.85	1.51	1 17	⅝	75.1	10.15	8.
11-16	31.68	1.81	1.42	11-16	77 95	10.95	8.6
¾	34.57	2.15	1.7	¾	80.75	11.70	9.24
13-16	36.46	2.54	2.	13-16	83.60	12.60	9.85
⅞	40.39	2.95	2.3	⅞	86.58	13.46	10.55
15-16	43.27	3.37	2.64	15-16	09.45	14.35	11.25
1	46.15	3.84	3.01	2	92.25	15.35	12.

The object of this Diamond Point can be readily seen, in that it prevents the Set from slipping from the head of the nail while in use, thus saving in many cases some valuable piece of work.

It is fast taking the place of every other Nail Set.
Once seen, Mechanics will have no other.

These Sets are carefully made from the Best Quality of Tool Steel. The Points are turned and thoroughly tempered, and will not break off.

EACH SET FULLY WARRANTED.

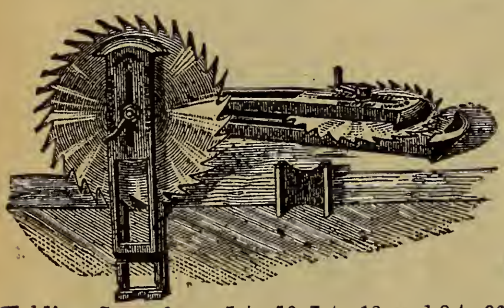
The Trade Supplied. Put up in boxes of 1 dozen, 1-4 gross and 1 gross. Assorted sizes. Prices and terms upon application.

MANUFACTURED ONLY BY

The EDWARD STORM SPRING CO., Limited,

POUGHKEEPSIE, N. Y.

COXHEAD'S
Combined Saw Vise and Set.



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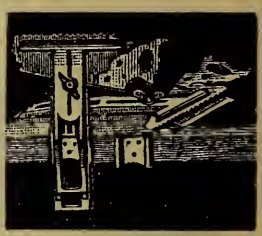
July 25, 1882,
and
March 8, 1887.



Made in 3 Sizes for Circular Saws.

Holding Saws from 5 to 10, 7 to 18, and 8 to 26 inches in diameter. Also in TWO SIZES FOR HAND, BAND AND SCROLL SAWS.

THESE VISES ARE ALSO MADE WITHOUT THE SETS.

A SAMPLE TESTIMONIAL:

THOMAS LITTLE & SON, Carpenters and Builders, 718 South Eleventh St., PHILADELPHIA, Pa., Dec. 4, 1886.

Mr. JOHN F. COXHEAD: *Dear Sir*—Your No. 4 Combined Saw Set and Vise, which we received last month, is superior in every respect to anything we have yet had, and we can cheerfully recommend it.

Respectfully yours, THOMAS LITTLE & SON.

Send for Catalogue and Trade Discount.

Manufactured by JOHN F. COXHEAD, Poughkeepsie, N.Y.

Weight of Iron, Steel, Copper and Brass Plates.

DIAMETER AND THICKNESS DETERMINED BY AMERICAN GAUGE.

No. of Gauge.	Size of each No.	Weight of Plates per Square Foot.			
		Wrought Iron.	Steel.	Copper.	Brass.
	Inch.	Lbs.	Lbs.	Lbs.	Lbs.
0000	.46000	17.25	17.48	20.838	19.688
000	.40964	15.3615	15.5663	18.557	17.533
00	.36480	13.68	13.8624	16.525	15.613
0	.32486	12.1823	12.3447	14.716	13.904
1	.28930	10.8488	10.9934	13.105	12.382
2	.25763	9.6611	9.7899	11.671	11.027
3	22942	8.6033	8.7180	10.393	9.8192
4	.20431	7.6616	7.7638	9.2552	8.7445
5	.18194	6.8228	6.9137	8.2419	7.787
6	.16202	6.0758	6.1568	7.3395	6.9345
7	.14428	5.4105	5.4826	6.5359	6.1752
8	.12849	4.8184	4 8826	5.8206	5.4994
9	.11443	4.2911	4.3483	5.1837	4.8976
10	.10189	3.8209	3.8718	4.6156	4.3609
11	.090742	3.4028	3.4482	4.1106	3.8838
12	.080808	3 0303	3.0707	3.6606	3.4586
13	.071961	2.6985	2.7345	3.2593	3.0799
14	.064084	2.4032	2.4352	2.9030	2.7428
15	.057068	2.1401	2.1686	2.5852	2.4425
16	.050820	1.9058	1.9312	2.3021	2.1751
17	.045257	1.6971	1.7193	2.0501	1.937
18	.040303	1.5114	1.5315	1.8257	1.725
19	.035890	1.3459	1.3638	1.6258	1.5361
20	.031961	1.1985	1.2145	1.4478	1.3679
21	.028462	1.0673	1.0816	1.2893	1.2182
22	.025347	.95051	.96319	1.1482	1.0849
23	.022571	.84641	.8577	1.0225	.96604
24	.020100	.75375	.7638	.91053	.86028
25	.017900	.67125	.6802	.81087	.76612
26	.01594	.59775	.60572	.72208	.68223
27	.014195	.53231	.53941	.64303	.60755
28	.012641	.47404	.48036	.57264	.54103
29	.011257	.42214	.42777	.50994	.48180
30	.010025	.37594	.38095	.45413	.42907
31	.008928	.3348	.33926	.40444	.38212
32	.007950	.29813	.3021	.36014	.34026
33	.007080	.2655	.26904	.32072	.30302
34	.006304	.2364	23955	.28557	.26981
35	.005614	.21053	.21333	.25431	.24028
36	.005000	.1875	.19	.2265	.2140
37	.004453	.16699	.16921	.20172	.19059
38	.003965	.14869	.15067	.17961	.1697
39	.003531	.13241	13418	.15995	.15113
40	.003144	.1179	.11947	.14242	.13456
Specific Grav.....		7.200	7.296	8.698	8.218
Weight per Cubic Foot...		450.	456.	543.6	513.6

Seamless Brass and Copper Tubing.

List of Regular Sizes.			Weight per ft.		List of Regular Sizes.			Weight per ft.	
Outside Diam.	Length.	Stubs' Wire Gauge.	Brass.	Copper.	Outside Diam.	Length.	Stubs' Wire Gauge.	Brass.	Copper.
3/8	12 ft.	19	.18	.19	2 1/8	12 ft.	12	2.53	2.66
1/2	"	18	.27	.29	2 1/4	"	12	2.68	2.82
5/8	"	18	.33	.35	2 3/8	"	12	2.84	2.99
3/4	"	17	.46	.49	2 1/2	"	10	3.74	3.94
13/16	"	17	.49	.53	2 5/8	"	10	3.99	4.15
7/8	"	17	.53	.58	2 3/4	"	10	4.14	4.36
15/16	"	16	.63	.67	3	"	10	4.54	4.78
1	"	16	.67	.71	3 1/4	"	10	4.94	5.20
1 1/8	"	16	.76	.80	3 1/2	"	10	5.35	5.63
1 1/4	"	15	.97	1.02	4	"	10	6.14	6.46
1 3/8	"	14	1.22	1.29	4 1/8	"	10	6.33	6.66
1 1/2	"	14	1.36	1.44	4 1/4	"	10	6.52	6.86
1 5/8	"	13	1.65	1.74	4 3/8	"	10	6.72	7.07
1 3/4	"	13	1.79	1.88	4 1/2	"	10	6.92	7.28
1 13/16	"	13	1.83	1.92	4 3/4	"	10	7.30	7.68
1 7/8	"	12	2.19	2.31	5	"	10	7.67	8.08
1 15/16	"	12	2.28	2.40	5 1/2	"	10	8.49	8.94
2	"	12	2.35	2.47	6	"	10	9.31	9.79

Weight of Brass, Copper and Zinc Tubing, per Foot.

NUMBERED BY BROWN & SHARPE'S GAUGE.

Weight in Thousandths of Pounds.

BRASS. No. 17.		BRASS. No. 20.		COPPER. Lightning-Rod Tube. No. 23.	
Inch.	Pounds.	Inch.	Pounds.	Inch.	Pounds.
1/4	.107	1/8	.032	1/2	.162
5/16	.157	3/16	.039	9/16	.176
3/8	.185	1/4	.063	5/8	.186
7/16	.234	5/16	.106	11/16	.211
1/2	.266	3/8	.126	3/4	.229
9/16	.318	7/16	.158		
5/8	.333	1/2	.189	ZINC. No. 26.	
3/4	.377	9/16	.208		
7/8	.462	5/8	.220	1/2	.161
1	.542	3/4	.252	5/8	.185
1 1/8	.675	7/8	.284	3/4	.234
1 1/4	.740	1	.378	7/8	.272
1 1/2	.915	1 1/4	.500	1	.311
1 3/4	.980	1 1/2	.580	1 1/4	.380
2	1.506			1 1/2	.452
2 1/2	1.90				
3	2.188				

SEAMLESS COPPER TUBING.

Weight per Foot, in Pounds.

O. D.	STUBS' WIRE GAUGE.						O. D.	STUBS' WIRE GAUGE.					
Inches.	11	12	13	14	15	16	Inches.	11	12	13	14	15	16
1/2	.57	.50	.46	.41	.37	.33	3	4.35	3.81	3.30	2.90	2.51	2.23
5/8	.76	.66	.60	.52	.47	.42	3 1/8	4.54	3.97	3.44	3.02	2.61	2 32
3/4	.94	.82	.74	.64	.58	.52	3 1/4	4.73	4.13	3.58	3.14	2.72	2.42
7/8	1.13	1.00	.88	.76	.69	.62	3 3/8	4.92	4.29	3.72	3.26	2.82	2.51
1	1.32	1.16	1.02	.89	.80	.71	3 1/2	5.12	4.47	3.87	3.38	2.93	2.61
1 1/8	1.51	1.32	1.17	1.01	.91	.80	3 5/8	5.31	4.64	4.01	3.50	3.04	2.70
1 1/4	1.71	1.49	1.31	1.14	1.02	.90	3 3/4	5.50	4 82	4.15	3.62	3.14	2.80
1 3/8	1.90	1.65	1.46	1.29	1.12	1.00	3 7/8	5.69	4.99	4.29	3.74	3.24	2.89
1 1/2	2.08	1.82	1.60	1.44	1.23	1.09	4	5.88	5.15	4.44	3.86		
1 5/8	2.26	1.98	1.74	1.58	1.34	1.18	4 1/8	6.06	5.31	4.58	3.98		
1 3/4	2.46	2.15	1.88	1.70	1.45	1.28	4 1/4	6.24	5.48	4.72	4.10		
1 7/8	2.65	2.31	2.02	1.82	1.55	1.37	4 3/8	6.43	5.64	4.86	4.22		
2	2.84	2.47	2.16	1.94	1.66	1.47	4 1/2	6.62	5.80	5.00	4.34		
2 1/8	3.02	2.66	2.30	2.06	1.76	1.56	4 5/8	6.80	5.96	5.15	4.46		
2 1/4	3.21	2.82	2.45	2.18	1.86	1.66	4 3/4	6.99	6.13	5.29	4 58		
2 3/8	3.40	2.99	2.59	2.30	1.97	1.75	5	7.35	6.46	5.57	4.82		
2 1/2	3.59	3.15	2.73	2.42	2.07	1.85	5 1/4	7.74	6.79				
2 5/8	3.78	3.32	2.87	2.54	2.18	1.94	5 1/2	8.13	7.12				
2 3/4	3.97	3.48	3.01	2.66	2.29	2.04	5 3/4	8.52	7.45				
2 7/8	4.16	3.65	3.16	2.78	2.40	2.13	6	8.90	7.78				

To ascertain weight of Seamless Brass Tubing, multiply by .95.

IRON PIPE SIZES.

Outside Diam.	Same as Iron Size.	Length.	Weight per ft. Brass. Lbs.	Weight per ft. Copper. Lbs.	Outside Diam.	Same as Iron Size.	Length.	Weight per ft. Brass Lbs.	Weight per ft. Copper. Lbs.
12/64	1/8	12 ft.	.31	.33	1 5/8	1 1/4	12 ft.	2.42	2.54
9/16	1/4	"	.42	.44	1 7/8	1 1/2	"	2.92	3.07
11/16	3/8	"	.56	.59	2 3/8	2	"	3.90	4.09
13/16	1/2	"	.81	.85	2 7/8	2 1/2	"	5 14	5.41
1 1/16	3/4	"	1.19	1.25	3 1/2	3	"	8.08	8.50
1 5/16	1	"	1.66	1.74					

SIZES AND WEIGHT OF COPPER TUBE.

NO. 18 STUBS' WIRE GAUGE.*

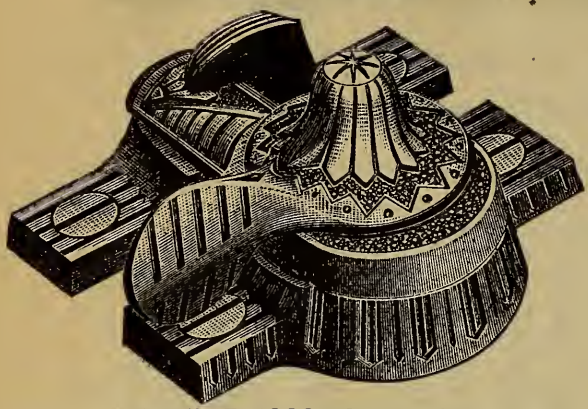
INSIDE DIAMETER.	WEIGHT PER FOOT.	INSIDE DIAMETER.	WEIGHT PER FOOT.	INSIDE DIAMETER.	WEIGHT PER FOOT.
1/2	.32	1 1/4	.95	2	1.40
5/8	.43	1 3/8	1.02	2 1/8	1.50
3/4	.55	1 1/2	1.10	2 1/4	1.60
7/8	.65	1 5/8	1.15	2 3/8	1.70
1	.75	1 3/4	1.20	2 1/2	1.80
1 1/8	.85	1 7/8	1.30		

In ordering, state whether Tubes are to be annealed for bending.

* The above weights are theoretically correct, but in practice deviations from the theoretical weight must be expected.

IVES' PATENT SASH LOCKS.

WARRANTED BURGLAR PROOF.



A very important feature of the Ives Sash Lock is in its securely locking when closed, and simultaneously drawing the meeting rails closely together. All the movements are accomplished by cams without the instrumentality of springs, thus avoiding the possibility of getting out of order.

Ives' Patent Sash Locks
—AND—
DOOR BOLTS
Are for Sale by all Dealers in Hardware.

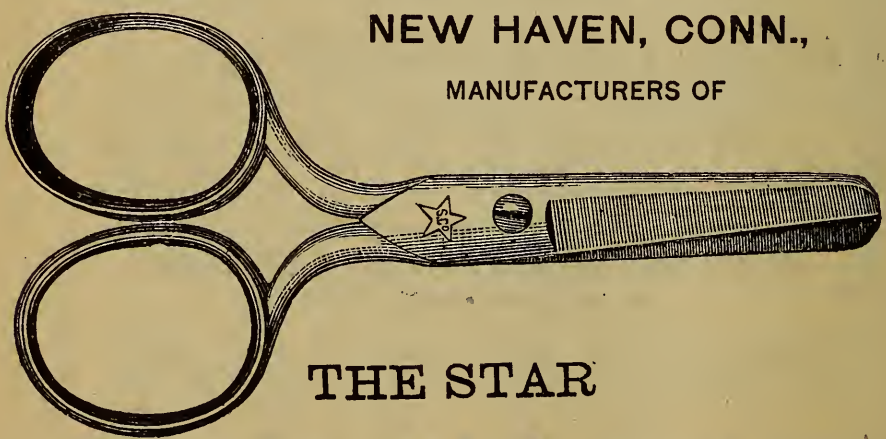
Patented April 17, 1883; Oct. 16, '83; Dec. 30, '84;
March 24, '85; May 12, '85; June 23, '85;
Patented in Canada March 24, 1886.

HOBART B. IVES & CO.,
SOLE MANUFACTURERS AND PATENTEES,
Send for Illustrated Price-Lists. **NEW HAVEN, CONN.**

WM. SCHOLLHORN & CO.,

NEW HAVEN, CONN.,

MANUFACTURERS OF



THE STAR

SCISSORS AND SHEARS.

Full line of Straight and Bent Trimmers, Bankers' and Paper Shears, Barbers' Shears, Ladies' Embroidery, Pocket and Buttonhole Scissors.

WARRANTED SUPERIOR QUALITY. FULL NICKEL-PLATED.

STANDARD WEIGHTS OF LEAD PIPE, Etc.

WEIGHT PER FOOT OF LEAD PIPE AND TIN-LINED LEAD PIPE.

Calibre	AAA Brooklyn.		AA Ex Strong		A Strong.		B Medium.		C Light.		D Ex Light.		E Fountain.	
	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz	Lb.	Oz.	Lb.	Oz.
⅜	1	8	1	5	1	2	1	0	0	13	0	10	0	8
½	3	0	2	0	1	12	1	4	1	0	0	13	0	11
⅝	3	8	2	12	2	8	2	0	1	12	1	8	1	0
¾	4	8	3	8	3	0	2	4	2	0	1	12	1	4
1	6	0	4	12	4	0	3	4	2	8	2	0	1	8
1¼	6	12	5	12	4	12	3	12	3	0	2	8	2	0
1½	9	0	8	0	6	4	5	0	4	4	3	8	3	4
2	10	12	9	0	7	0	6	0	5	4	4	0		

LEAD WASTE PIPE.

1¼ inch, 2 lbs.....per foot.
2 " 3 lbs..... "
2½ " 4 and 6 lbs.... "
3 " 3½, 4½ & 5 lbs. "

4 inch, 4½, 5, 6 & 8 lbs...per foot.
4½ inch, 6, 6¾ & 8 lbs... "
5 inch, 8, 10 & 12 lbs.... "
6 " 9¾ and upwards.. "

EXTRA WEIGHTS OF LEAD PIPE.

Calibre.	7-16 Thick.		⅜ Thick.		5-16 Thick.		¼ Thick.		3-16 Thick.	
	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.	Lb.	Oz.
2½ inches..	0	0	16	11	13	11	11	0	7	13
3 " ..	0	0	19	10	16	0	12	0	9	0
3½ " ..	26	10	21	10	18	5	15	0	9	8
4 " ..	30	0	25	0	21	0	16	0	12	8
4½ " ..	0	0	0	0	0	0	18	0	14	0
5 " ..	0	0	31	0	0	0	20	0	0	0

PATENT FINISH DROP SHOT.

AMERICAN STANDARD SIZES.

	Diameter in 100ths of an inch.	No. of Shot to the oz
Extra Fine Dust..	1½	84021
Fine Dust.....	3	10784
Dust	4	4565
No. 12.....	5	2326
" 11.....	6	1346
" 10.....Trap Shot		1056
" 10.....	7	848
" 9.....Trap Shot		688
" 9.....	8	568
" 8.....Trap Shot		472
" 8.....	9	399
" 7... .....Trap Shot		338
" 7.....	10	291

	Diameter in 100ths of an inch.	No. of Shot to the oz.
No. 6.....	11	218
" 5.....	12	168
" 4.....	13	132
" 3.....	14	106
" 2.....	15	86
" 1.....	16	71
" B	17	59
" BB.	18	50
" BBB	19	42
" T	20	36
" TT.....	21	31
" F	22	27
" FF.....	23	24

COMPRESSED BUCK SHOT.

	Diameter in 100ths of an inch.	No. of Balls to the lb
No. 3.....	25	284
" 2.....	27	232
" 1.....	30	173
" 0.....	32	140

	Diameter in 100ths of an inch.	No. of Balls to the lb.
No. 00.....	34	115
" 000.....	36	93
Balls.....	38	85
"	44	50

RULES FOR COMPUTING WEIGHTS OF METALS.

I.—CAST IRON.

To find the weight of a cast-iron rod or bar: multiply the weight of a wrought rod or bar from the usual tables, and deduct 2.27 of its weight.

II.—WROUGHT IRON.

To compute the weight of any piece of wrought iron: find the number of cubic inches it contains and multiply by .2816. This will give the weight in pounds.

III.—CAST IRON.

Multiply the number of cubic inches by .2607.

IV.—COPPER.

To compute the weight of copper: ascertain the number of cubic inches, and multiply by .3242.

V.—LEAD.

To compute the weight of lead: multiply the number of cubic inches by .41015.

VI.—BRASS.

To compute the weight of brass: multiply the number of cubic inches by .3112.

USEFUL MATHEMATICAL RULES.

To find the area of a parallelogram: multiply the length by the breadth.

To find the circumference of a circle: multiply the diameter by 3.14159.

To find the diameter of a circle: multiply the circumference by .31831.

To find the area of a circle: multiply the square of the diameter by .7854; or, multiply the square of the circumference by .079577; or, multiply half the diameter by half the circumference.

To find the area of a circular ring: multiply the sum of the diameters of the two circles by the difference of the diameters, and that product by .7854.

To find the side of a square that shall equal the area of a given diameter or circumference: multiply the diameter of the circle by .886227; or, multiply the circumference of the circle by .282094.

To find the diameter of a circle that shall contain the area of a given square: multiply the side of the given square by 1.12838.

To find the side of the largest square that can be inscribed in a circle of a given diameter or circumference: multiply the given diameter by .707106; or, multiply the given circumference by .225079.

To find the circumference of a circle required to exactly admit a square of a given side: multiply the given side by .225079.

VALUE OF IRON.

VALUE PER GROSS TON (2240 LBS.) OF IRON AT FROM 1-10TH OF A CENT TO 10 CENTS PER POUND, INCREASING AT RATE OF 1-10TH OF A CENT PER POUND.

Per Lb.	Per Ton.	Per Lb.	Per Ton.	Per Lb.	Per Ton.
$0.001	$2.24	$0.035	$78.40	$0.068	$152.32
0.002	4.48	0.036	80.64	0.069	154.56
0.003	6.72	0.037	82.88	0.070	156.80
0.004	8.96	0.038	85.12	0.071	158.04
0.005	11.20	0.039	87.36	0.072	161.28
0.006	13.44	0.040	89.60	0.073	163.52
0.007	15.68	0.041	91.84	0.074	165.76
0.008	17.92	0.042	94.08	0.075	168.00
0.009	20.16	0.043	96.32	0.076	170.24
0.010	22.40	0.044	98.56	0.077	172.48
0.011	24.64	0.045	100.80	0.078	174.72
0.012	26.88	0.046	103.04	0.079	176.96
0.013	29.12	0.047	105.28	0.080	179.20
0.014	31.36	0.048	107.52	0.081	181.44
0.015	33.60	0.049	109.76	0.082	183.68
0.016	35.84	0.050	112.00	0.083	185.92
0.017	38.08	0.051	114.24	0.084	188.16
0.018	40.32	0.052	116.48	0.085	190.40
0.019	42.56	0.053	118.72	0.086	192.64
0.020	44.80	0.054	120.96	0.087	194.88
0.021	47.04	0.055	123.20	0.088	197.12
0.022	49.28	0.056	125.44	0.089	199.36
0.023	51.52	0.057	127.68	0.090	201.60
0.024	53.76	0.058	129.92	0.091	203.84
0.025	56.00	0.059	132.16	0.092	206.08
0.026	58.24	0.060	134.40	0.093	208.32
0.027	60.48	0.061	136.64	0.094	210.56
0.028	62.72	0.062	138.88	0.095	212.80
0.029	64.96	0.063	141.12	0.096	215.04
0.030	67.20	0.064	143.36	0.097	217.28
0.031	69.44	0.065	145.60	0.098	219.52
0.032	71.68	0.066	147.84	0.099	221.76
0.033	73.92	0.067	150.08	0.100	224.00
0.034	76.16				

SIZE AND STRENGTH OF CAST-IRON COLUMNS.

Capable of Sustaining Load, Expressed in Cwts.

DIAMETER IN INCHES.

H'g't. Ft.	2½	3	3½	4	4½	5	6	7	8	9	10	11	12
4	119	178	247	320	418	522	607	1032	1333	1716	2119	2570	3050
6	60	105	143	232	318	400	501	591	1015	1397	1600	2150	3040
8	40	91	165	214	288	379	479	573	980	1289	1659	2045	2490
10	32	65	111	172	242	327	427	525	924	1224	1603	2007	2450
12	26	55	97	156	220	301	394	497	887	1161	1564	1910	2900

LIST OF EXTRAS ON BAR IRON.

ORDINARY SIZES. Rounds and Squares.....$\frac{3}{4}$ to 2 in. diam.
Flats.....1 to 4×$\frac{3}{8}$ to 1½ and 4½ to 6×$\frac{3}{8}$ to 1.

EXTRA SIZES.

Rounds and Squares.	Extra in cts. per lb	Flats.	Extra in cts. per lb	Flats.	Extra in cts. per lb
No. 6 and $\frac{3}{16}$ in.	1.3	$\frac{1}{32}\times\frac{3}{32}$	4.0	$\frac{7}{16}\times\frac{7}{32}$	1.5
No. 5	1.0	$\frac{1}{32}\times\frac{1}{8}$	3.5	$\frac{7}{16}\times\frac{1}{4}$	1.3
No. 4	0.8	$\frac{1}{32}\times\frac{5}{32}$	3.0	$\frac{1}{2}$ & $\frac{9}{16}\times\frac{3}{16}$	1.2
Nos. 2, 3, $\frac{1}{4}$ & $\frac{9}{32}$	0.7	$\frac{1}{32}\times\frac{3}{16}$	2.5	$\frac{1}{2}$ & $\frac{9}{16}\times\frac{1}{4}$ to $\frac{3}{8}$	1.1
$\frac{5}{16}$	0.6	$\frac{3}{8}\times\frac{3}{32}$	3.6	$\frac{5}{8}$ & $\frac{11}{16}\times\frac{3}{16}$	0.9
$\frac{3}{8}$	0.5	$\frac{3}{8}\times\frac{1}{8}$	3.0	$\frac{5}{8}$ & $\frac{11}{16}\times\frac{1}{4}$ & $\frac{5}{16}$	0.7
$\frac{7}{16}$	0.4	$\frac{3}{8}\times\frac{5}{32}$	2.5	$\frac{5}{8}$ & $\frac{11}{16}\times\frac{3}{8}$ to $\frac{1}{2}$	0.5
$\frac{1}{2}$ & $\frac{9}{16}$	0.2	$\frac{3}{8}\times\frac{11}{64}$	2.3	$\frac{3}{4}\times\frac{3}{16}$	0.7
$\frac{5}{8}$ & $\frac{11}{16}$	0.1	$\frac{3}{8}\times\frac{3}{16}$	2.0	$\frac{3}{4}\times\frac{1}{4}$ & $\frac{5}{16}$	0.5
2⅛ to 2⅞	0.1	$\frac{3}{8}\times\frac{7}{32}$	1.8	$\frac{3}{4}\times\frac{3}{8}$ to $\frac{5}{8}$	0.4
3 to 3½	0.3	$\frac{3}{8}\times\frac{1}{4}$	1.6	$\frac{7}{8}\times\frac{3}{16}$	0.6
3$\frac{9}{16}$ to 4	0.5	$\frac{1}{32}\times\frac{3}{32}$	3.0	$\frac{7}{8}\times\frac{1}{4}$ & $\frac{5}{16}$	0.5
4$\frac{1}{16}$ to 4½	0.6	$\frac{1}{32}\times\frac{1}{8}$	2.6	$\frac{7}{8}\times\frac{3}{8}$ to $\frac{3}{4}$	0.4
4$\frac{9}{16}$ to 5	0.8	$\frac{1}{32}\times\frac{9}{64}$	2.5	1×1$\frac{3}{16}$	0.4
HALF ROUND.		$\frac{1}{32}\times\frac{5}{32}$	2.2	1 to 6×1$\frac{1}{4}$×1$\frac{5}{16}$	0.2
		$\frac{1}{32}\times\frac{3}{16}$	1.8	2 to 4×1$\frac{9}{16}$ to 2	0.2
$\frac{7}{8}$ to 1$\frac{1}{4}$	0.5	$\frac{1}{32}\times\frac{7}{32}$	1.6	2 to 4×2$\frac{1}{16}$ to 3	0.3
4/4 & 1$\frac{3}{16}$	0.6	$\frac{1}{32}\times\frac{1}{4}$	1.4	4$\frac{1}{16}$ to 6×1$\frac{1}{16}$ to 2	0.2
$\frac{5}{8}$ & 1$\frac{1}{16}$	0.7	$\frac{7}{16}\times\frac{1}{8}$	2.3	4$\frac{1}{16}$ to 6×2$\frac{1}{16}$ to 3	0.4
$\frac{1}{2}$ & $\frac{9}{16}$	0.9	$\frac{7}{16}\times\frac{5}{32}$	1.9		
$\frac{3}{8}$ & $\frac{7}{16}$	1.1	$\frac{7}{16}\times\frac{3}{16}$	1.6		

For cutting to specific lengths, 10 to 20 feet, 0.2 cent extra.

CAST STEEL CROWBARS.

Weight	—	8	10	12	14	16	18
Inch Square	—	$\frac{7}{8}$	1	1$\frac{1}{16}$	1$\frac{1}{8}$	1$\frac{3}{16}$	1$\frac{1}{4}$
Inches in Length.	—	48	54	62	63	66	67
Weight	20	22	24	26	28	30	
Inch Square	1$\frac{1}{4}$	1$\frac{5}{16}$	1$\frac{3}{8}$	1$\frac{3}{8}$	1$\frac{1}{2}$	1$\frac{1}{2}$	
Inches in Length..	72	72	72	74	74	76	

COPPER SHEATHING SHEETS.

Sheathing is the name applied only to sheets measuring 14x48 inches.
Showing Wt. per sheet, No. of sheets per case and Wt per case.

Oz. per sq. foot...	16	18	20	22	24	26	28	30	32
Pounds per sheet.	4.10	5.4	5.13	6.7	7.	7.9	8.3	8.12	9.5
Sheets per case...	125	115	100	100	85	80	75	70	65
Pounds per case..	583	604	583	642	595	607	613	613	607

WEIGHT OF HOOP IRON.

One Foot in Length.

Thickness.		⅝	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	2
No.	Inch.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
21	.0334	.0716	.0861	.1	.115	.129	.144	.158	.172	.197	.201	.229
20	.0375	.0731	.0938	.109	.125	.141	.156	.172	.188	.203	.219	.25
19	.0438	.0911	.109	.128	.146	.164	.182	.2	.219	.238	.257	.292
18	.05	.104	.125	.146	.167	.188	.208	.229	.25	.271	.292	.333
17	.0563	.117	.141	.164	.188	.211	.234	.258	.281	.305	.328	.375
16	.0625	.13	.156	.182	.208	.234	.26	.286	.313	.339	.365	.417
15	.075	.156	.188	.219	.25	.281	.413	.344	.375	.307	.438	.5
14	.0875	.183	.219	.256	.293	.239	.366	.402	.438	.475	.512	.585
13	.1	.203	.25	.292	.333	.375	.416	.458	.5	.543	.584	.667
12	.1125	.234	.281	.328	.375	.422	.469	.516	.563	.609	.656	.75
11	.125	.26	.313	.365	.417	.469	.521	.573	.625	.677	.729	.833
10	.1406	.293	.352	.41	.469	.527	.586	.645	.703	.762	.82	.838
9	.1563	.326	.391	.456	.522	.587	.652	.717	.783	.848	.913	1.04
8	.1919	.358	.43	.501	.573	.644	.716	.788	.859	.931	1.	1.15
7	.1875	.391	.469	.547	.625	.703	.781	.859	.938	1.02	1.1	1.25
6	.2031	.423	.508	.593	.677	.762	.836	.931	1.02	1.1	1.19	1.35
5	.2188	.456	.547	.638	.729	.82	.912	1.	1.09	1.19	1.28	1.46
4	.2344	.488	.586	.683	.781	.879	.977	1.07	1.17	1.27	1.37	1.56

HOOP AND SCROLL IRON.

Number of Feet in a Bundle of 56 Pounds.

HOOP IRON.

Size.		Feet in Bundle.
Width.	Thick.	
⅝ inches.	No. 21	815
¾ inches.	No. 20	630
⅞ inches.	No. 19	450
1 inches.	No. 18	360
1⅛ inches.	No. 17	278
1¼ inches.	No. 16	217
1½ inches.	No. 15	160
1¾ inches.	No. 15	139
2 inches.	No. 14	110

SCROLL IRON.

Size.		Feet in Bundle.
Width.	Thick.	
⅛ inches.	No. 10	240
⅛ inches.	No. 16	430
⅛ inches.	No. 14	347
⅛ inches.	No. 10	190
¾ inches.	No. 16	360
¾ inches.	No. 14	290
¾ inches.	No. 12	208
¾ inches.	No. 10	160
⅞ inches.	No. 16	310
⅞ inches.	No. 14	249
⅞ inches.	No. 12	175
1 inches.	No. 16	270
1 inches.	No. 14	216
1 inches.	No. 12	152

BREAKING STRAIN UPON VARIOUS METALS.

The size of the rod tested being in each case one inch square, and the number of pounds the actual breaking strain.

	Lbs.
Cast iron	19,000
Ordinary bar iron	70,000
Best Swedes iron	84,000
Soft steel	120,000
Hard steel	150,000
Lead	860
Zinc	2,600
Tin	5,500
Copper	35,000
Silver	41,000
Gold	22,000

Weight of Flat Iron.

WEIGHT OF RUNNING FOOT IN POUNDS.

Width in Inches.	Thickness in Inches. 1-16	1-8	3-16	1-4	5-16	3-8	Width in Inches.	Thickness in Inches. 1-16	1-8	3-16	1-4	5-16	3-8
1	.21	.41	.62	.83	1.04	1.25	5⅜	1.12	2.24	3.36	4.48	5.6	6.72
⅛	.23	.47	.7	.94	1.17	1.41	½	1.14	2.29	3.44	4.58	5.73	6.88
¼	.26	.52	.78	1.04	1.3	1.56	⅝	1.17	2.34	3.52	4.69	5.86	7.03
⅜	.29	.57	.86	1.14	1.43	1.72	¾	1.2	2.39	3.59	4.79	6.	7.19
½	.31	.62	.94	1.25	1.56	1.87	⅞	1.22	2.45	3.67	4.9	6.12	7.34
⅝	.34	.68	1.01	1.35	1.69	2.03	6	1.25	2.5	3.75	5.	6.25	7.5
¾	.36	.73	1.09	1.46	1.82	2.19	⅛	1.27	2.55	3.83	5.1	6.39	7.66
⅞	.39	.78	1.17	1.56	1.95	2.34	¼	1.3	2.6	3.91	5.2	6.51	7.81
2	.42	.83	1.25	1.67	2.08	2.5	⅜	1.32	2.66	3.98	5.31	6.64	7.97
⅛	.44	.88	1.33	1.77	2.21	2.65	½	1.35	2.7	4.06	5.41	6.77	8.13
¼	.47	.94	1.4	1.87	2.34	2.81	⅝	1.38	2.76	4.14	5.52	6.91	8.29
⅜	.5	.99	1.48	1.98	2.47	2.97	¾	1.40	2.81	4.22	5.62	7.03	8.44
½	.52	1.04	1.56	2.09	2.6	3.12	⅞	1.43	2.86	4.3	5.73	7.16	8.59
⅝	.55	1.09	1.64	2.19	2.73	3.28	7	1.46	2.92	4.37	5.83	7.29	8.75
¾	.57	1.14	1.72	2.29	2.86	3.44	¼	1.51	3.02	4.53	6.04	7.55	9.07
⅞	.6	1.2	1.8	2.4	2.99	3.59	½	1.56	3.12	4.69	6.25	7.81	9.37
3	.62	1.25	1.87	2.5	3.12	3.75	¾	1.61	3.23	4.84	6.46	8.07	9.69
⅛	.65	1.3	1.95	2.6	3.26	3.91	8	1.67	3.33	5.	6.67	8.33	10.
¼	.68	1.35	2.03	2.7	3.38	4.06	¼	1.72	3.43	5.16	6.87	8.6	10.3
⅜	.7	1.4	2.11	2.81	3.52	4.22	½	1.77	3.54	5.32	7.08	8.85	10.63
½	.73	1.46	2.19	2.91	3.65	4.37	¾	1.82	3.65	5.47	7.29	9.11	10.94
⅝	.76	1.51	2.27	3.02	3.78	4.53	9	1.87	3.75	5.62	7.5	9.37	11.25
¾	.78	1.56	2.34	3.12	3.91	4.69	¼	1.93	3.85	5.78	7.71	9.63	11.56
⅞	.81	1.61	2.42	3.23	4.03	4.84	½	1.98	3.96	5.94	7.92	9.89	11.87
4	.83	1.66	2.5	3.33	4.17	5.00	¾	2.03	4.06	6.09	8.12	10.15	12.19
⅛	.86	1.72	2.58	3.44	4.3	5.16	10	2.08	4.17	6.25	8.33	10.4	12.5
¼	.88	1.77	2.66	3.54	4.43	5.31	¼	2.13	4.27	6.4	8.54	10.67	12.8
⅜	.91	1.82	2.73	3.64	4.56	5.47	½	2.19	4.37	6.56	8.75	10.93	13.13
½	.94	1.87	2.81	3.75	4.69	5.62	¾	2.24	4.48	6.72	8.96	11.20	13.43
⅝	.96	1.93	2.89	3.85	4.82	5.78	11	2.29	4.58	6.87	9.16	11.45	13.75
¾	.99	1.98	2.97	3.96	4.95	5.94	¼	2.34	4.69	7.03	9.37	11.72	14.06
⅞	1.01	2. 3	3.05	4.06	5.08	6.1	½	2.39	4.79	7.18	9.58	11.97	14.37
5	1.04	2. 8	3.12	4.17	5.21	6.25	¾	2.45	4.89	7.34	9.79	12.25	14.69
⅛	1.06	2.13	3.2	4.27	5.34	6.41	12	2.5	5.	7.5	10.	12.5	15.
¼	1.1	2.19	3.28	4.37	5.47	6.56	.....	.....	.....	.....	.....	.....	.....

Weight of Flat Iron—Continued.

WEIGHT OF RUNNING FOOT IN POUNDS.

Width in Inches.	Thickness in Inches. 7-16	1-2	5-8	3-4	7-8	1
1	1.46	1.67	2.08	2.5	2.92	3.33
⅛	1.64	1.87	2.34	2.81	3.28	3.75
¼	1.82	2.08	2.6	3.12	3.65	4.17
⅜	2.01	2.29	2.86	3.44	4.01	4.58
½	2.19	2.5	3.12	3.75	4.37	5.
⅝	2.37	2.71	3.38	4.06	4.74	5.42
¾	2.55	2.92	3.64	4.37	5.11	5.83
⅞	2.73	3.12	3.9	4 69	5.47	6.25
2	2.92	3.33	4.16	5.	5.83	6.67
⅛	3.1	3.54	4.43	5.31	6.2	7.08
¼	3.28	3.75	4.69	5.62	6.56	7.5
⅜	3.46	3.96	4.95	5.94	6.93	7.92
½	3.65	4.17	5.21	6 25	7.29	8.33
⅝	3.83	4.37	5.47	6.56	7.66	8.75
¾	4.01	4.58	5.73	6.88	8.02	9.17
⅞	4.19	4.79	5.99	7.19	8.39	9.58
3	4.37	5.	6.25	7.5	8.75	10.
⅛	4.56	5.21	6.51	7.82	9.12	10.42
¼	4.74	5.42	6.77	8.12	9.48	10.83
⅜	4.92	5.62	7.03	8.44	9.84	11.25
½	5.1	5.83	7.29	8.75	10.21	11.67
⅝	5.29	6.04	7.55	9.07	10.59	12.08
¾	5.47	6.25	7.81	9.37	10.93	12.5
⅞	5.65	6.46	8.07	9.68	11.3	12.92
4	5.83	6.67	8.33	10.	11.65	13.33
⅛	6.02	6 87	8.59	10.3	12.04	13.75
¼	6.2	7.08	8.85	10.62	12 4	14.15
⅜	6.38	7.29	9.11	10.93	12.75	14.59
½	6.56	7.5	9.37	11.25	13.12	15 00
⅝	6.74	7.71	9.64	11.55	13.5	15.42
¾	6.93	7.92	9.89	11.87	13.85	15.83
⅞	7.11	8.12	10.15	12.2	14.22	16.25
5	7.29	8.33	10.42	12.5	14.59	16.65
⅛	7.48	8.51	10.69	12.8	14.95	17.09
¼	7.66	8.75	10.93	13.13	15.3	17.5

Width in Inches.	Thickness in Inches. 7-16	1-2	5-8	3-4	7-8	1
5⅜	7.84	8.96	11.2	13.43	15.68	17.92
½	8.02	9.17	11.45	13.75	16.03	18.33
⅝	8.2	9.37	11.72	14.07	16.4	18.75
¾	8.39	9.58	11.99	14.37	16.77	19.15
⅞	8.57	9.79	12.25	14.7	17.13	19.58
6	8.75	10.	12.5	15.	17.5	20.
⅛	8.93	10.2	12.77	15.3	17.85	20.42
¼	9.11	10.42	13.02	15.62	18.23	20.83
⅜	9.3	10.63	13.29	15.93	18.6	21.25
½	9.48	10.83	13.53	16.25	18.97	21.65
⅝	9.67	11.03	13.81	16.57	19.33	22.08
¾	9.84	11.25	14.05	16.87	19.7	22.5
⅞	10.02	11.45	14.32	17.19	20.03	22.92
7	10.2	11.65	14.59	17.5	20.42	23.33
¼	10.59	12.09	15.1	18.13	21.15	24.15
½	10.93	12.5	15.62	18.73	21.85	25.
¾	11.31	12.92	16.15	19.39	22 62	25.83
8	11.66	13.33	16.65	20.	23.33	26.65
¼	12.03	13.75	17.18	20.6	24.05	27.5
½	12.4	14.17	17.7	21.25	24.8	28.33
¾	12.76	14.58	18.23	21.89	25.52	29.17
9	13.12	15.	18.75	22.5	26.23	30.
¼	13.5	15.42	19.27	23.12	26.98	30 83
½	13.85	15.83	19.78	23.73	27.7	31.67
¾	14.2	16.25	20.32	24.35	28.42	32.5
10	14.59	16 65	20.82	25.	29.15	33.33
¼	14.93	17.08	21.33	25.62	29.88	34.17
½	15.3	17.5	21.89	26.25	30.62	35.
¾	15.67	17.92	22.4	26.85	31.33	35.83
11	16.03	18.33	22.9	27.5	32.08	36.65
¼	16.4	18.75	23.43	28.12	32.8	37.5
½	16.75	19.15	23.93	28.73	33 52	38.33
¾	17.13	19.59	24.49	29.35	34.25	39.15
12	17.5	20.	25.	30.	35.	40.
.....	.....	.....	.....	.....	.....	.....

FLAT IRON.

NUMBER OF FEET IN A BUNDLE OF 112 POUNDS.

Size.	Feet in Bundle.	Size.	Feet in Bundle.
½ by ¼ inch	267	⅞ by ¼ inch	155
½ " 5-16 "	216	⅞ " 5-16 "	122
½ " ⅜ "	175	⅞ " ⅜ "	100
⅝ " ¼ "	214	⅞ " 7-16 "	90
⅝ " 5-16 "	170	⅞ " ½ "	75
⅝ " ⅜ "	145	⅞ " ⅝ "	60
¾ " ½ "	106	1 " ¼ "	135
¾ " ¼ "	175	1 " 5-16 "	106
¾ " 5-16 "	142	1 " ⅜ "	90
¾ " ⅜ "	120	1 " 7-16 "	78
¾ " 7-16 "	103	1 " ½ "	65
¾ " ½ "	90	1 " 9-16 "	60
¾ " ⅝ "	70	1 " ⅝ "	52

Round and Square Iron.

NUMBER OF FEET IN A BUNDLE OF 112 POUNDS.

ROUND IRON.		SQUARE IRON.	
Size.	Feet in Bundle.	Size.	Feet in Bundle.
3-16 inch	1115	3-16 inch	958
¼ "	688	¼ "	540
5-16 "	440	5-16 "	345
⅜ "	305	⅜ "	240
7-16 "	225	7-16 "	176
½ "	170	½ "	135
9-16 "	136	9-16 "	107
⅝ "	110	⅝ "	87
11-16 "	90	11-16 "	70
¾ "	75	¾ "	60

Round Bar Iron.

WEIGHT OF A RUNNING FOOT IN POUNDS.

Diam. Inch.	Wt per. foot. Lbs.	Diam. Inch.	Wt. per foot. Lbs.	Diam. Inch.	Wt. per foot. Lbs.	Diam. Inch.	Wt. per foot. Lbs.
1-16	.01	1 1-16	2.975	2⅛	11.9	4 ⅛	44.85
⅛	.0411	⅛	3.338	¼	13.3	¼	47.54
3-16	.0925	3-16	3.725	⅜	14.75	⅜	50.33
¼	.1651	¼	4.12	½	16.4	½	53.32
5-16	.2573	5-16	4.545	⅝	18.1	⅝	56.34
⅜	.371	⅜	5.	¾	19.85	¾	59.44
7-16	.505	7-16	5.455	⅞	21.5	⅞	62.62
½	.657	½	5.945	3	23.7	5	65.88
9-16	.835	9-16	6.445	⅛	25.55	⅛	69.23
⅝	1.031	⅝	6.975	¼	27.81	¼	72.65
11-16	1.235	11-16	7.52	⅜	29.85	⅜	76.18
¾	1.475	¾	8.05	½	32.25	½	79.75
13-16	1.74	13-16	8.65	⅝	34.45	⅝	83.45
⅞	2.015	⅞	9.25	¾	37.1	¾	87.20
15-16	2.317	15-16	9.9	⅞	39.5	⅞	91.50
1	2.625	2	10.55	4	41.95	6	95.

FOR STEEL multiply tabular number above (for size) 1.01.

SQUARE BAR IRON.

WEIGHT OF A RUNNING FOOT, IN POUNDS.

Thick Inch.	Wt. per ft. Lbs.	Thick Inch.	Wt. per ft. Lbs.	Thick Inch.	Wt. per ft. Lbs.	Thick Inch.	Wt. per ft. Lbs.
1-16	.0131	1 1-16	3.80	2 1-8	15.15	4 1-8	57.20
1-8	.0525	1-8	4.25	1-4	17.	1-4	60.75
3-16	.1182	3-16	4.73	3-8	18.5	3-8	64.35
1-4	.2103	1-4	5.25	1-2	25.5	1-2	68.
5-16	.3200	5-16	5.78	5-8	23.1	5-8	72.
3-8	.4735	3-8	6.35	3-4	25.2	3-4	75.65
7-16	.6445	7-16	6.95	7-8	27.5	7-8	79.80
1-2	.84	1-2	7.55	3	30.05	5	83.8
9-16	1.063	9-16	8.2	1-8	32.75	1-8	88.25
5-8	1.314	5-8	8.85	1-4	35.5	1-4	92.5
11-16	1.59	11-16	9.57	3-8	38.25	3-8	97.15
3-4	1.8.	3-4	10.30	1-2	41.15	1-2	101.
13-16	2.221	13-16	11.05	5-8	44.15	5-8	105.8
7-8	2.575	7-8	11.83	3-4	47.20	3-4	110.5
15-16	2.95	15.16	12.62	7-8	50.25	7-8	115.15
1	3.35	2	13.4	4	53.75	6	120.25

FOR STEEL multiply tabular number above (for size) by 1.01.

BAND IRON.

NUMBER OF FEET IN A BUNDLE OF 112 POUNDS.

Size.		Feet in Bundle.	Size.		Feet in Bundle.
Width.	Thick.		Width.	Thick.	
1⅛ inches.	No. 12	265	2¾ inches.	No. 12	110
1⅛ "	" 10	213	2¾ "	" 10	88
1⅛ "	" 7	160	2¾ "	" 8	72
1¼ "	" 12	246	2¾ "	" 6	60
1¼ "	" 10	190	3 "	" 12	101
1¼ "	" 7	145	3 "	" 10	80
1½ "	" 12	205	3 "	" 8	66
1½ "	" 10	160	3 "	" 6	57
1½ "	" 7	120	3¼ "	" 10	75
1¾ "	" 12	175	3¼ "	" 8	60
1¾ "	" 10	138	3¼ "	" 6	50
1¾ "	" 8	110	3½ "	" 10	69
1¾ "	" 7	100	3½ "	" 8	57
2 "	" 12	155	3½ "	" 6	48
2 "	" 10	120	4 "	" 10	60
2 "	" 8	99	4 "	" 8	50
2 "	" 7	90	4 "	" 6	40
2 "	" 6	81	4½ "	" 10	52
2¼ "	" 12	135	4½ "	" 8	43
2¼ "	" 10	105	4½ "	" 6	35
2¼ "	" 8	88	5 "	" 10	48
2¼ "	" 6	72	5 "	" 8	40
2½ "	" 12	120	5 "	" 6	34
2½ "	" 10	95	6 "	" 10	40
2½ "	" 8	77	6 "	" 8	32
2½ "	" 6	65	6 "	" 6	26

Weight of Sheet and Plate Iron.

THICKNESS BY BIRMINGHAM WIRE GAUGE AND INCHES, WEIGHT OF A SQUARE FOOT IN POUNDS.

THICKNESS.		Weight Pounds.	THICKNESS.		Weight Pounds.
B. W. Gauge.	Part of an inch.		B. W. Gauge.	Part of an inch.	
36	.004	.126	11	.120	4.48
35	.005	.202		1/8 or .125	5.054
34	.007	.283	10	.134	5.426
33	.008	.322	9	.148	5.98
32	.009	.364		5-32 or .1562	6.305
31	.010	.405	8	.165	6.605
30	.012	.485	7	.180	7.27
29	.013	.526		3-16 or .1875	7.578
28	.014	.595	6	.203	8.005
27	.016	.677		7-32 or .2187	8.79
26	.018	.755	5	.22	8.912
25	.020	.811	4	.238	9.62
24	.022	.912		1/4 or .25	10.09
23	.025	1.018	3	.259	10437
22	.028	1.137		9-32 or .2812	11.38
	1-32 or .03125	1.259	2	.284	11.525
21	.032	1.31	1	.3	12.15
20	.035	1.416		5.16 or .3525	12.58
19	.042	1.695	0	.340	13.750
18	.049	1.075		11-32 or .3437	13.875
17	.058	2.35		3/8 or .375	15.10
16	.065	2.637	00	.380	15.26
	1-16 or .0625	2.518		13-32 or .4062	16.34
15	.072	2.92	000	.425	17.125
14	.083	3.35		8-16 or .4375	17.65
	3-32 or .0937	3.78	0000	.454	18.30
13	.095	3.85		15-32 or .4607	18.90
12	.100	4.4	00000	1/2 or .50	20.20

Weight of Sheet and Plate Iron.

THICKNESS IN INCHES. WEIGHT OF A SQUARE FOOT IN POUNDS.

Inches Thick.	Lbs. per Square Foot	Inches Thick.	Lbs. per Square Foot	Inches Thick.	Lbs. per SquareFoot.
9-16	22.5	1 3/4	70.62	3 7/8	156.51
5/8	25.21	13-16	73.14	4	161.55
11-16	27.75	7/8	75.58	1/8	166.6
3/4	30.25	15-16	78.20	1/4	171.76
13-16	32.75	2	80.75	3/8	176.71
7/8	35.26	1/8	85.75	1/2	181.77
15-16	37.75	1/4	90.81	5/8	186.79
1	40.35	3/8	95.86	3/4	191.84
1-16	42.87	1/2	100.9	7/8	196.9
1/8	45.4	5/8	105.95	5	201.85
3-16	47.9	3/4	111.	1/8	206.9
1/4	50.45	7/8	116.1	1/4	211.95
5-16	52.96	3	121.15	3/8	217.
3/8	55.45	1/8	126.21	1/2	222.05
7-16	58.01	1/4	131.26	5/8	227.01
1/2	60.52	3/8	136.32	3/4	232.15
9-16	63.05	1/2	141.37	7/8	237.2
5/8	65.56	5/8	146.41	6	242.25
11-16	68.11	3/4	151.46		

For STEEL PLATES multiply tabular numbers above (for Size) by 1.01.

Weight and Thickness of Boiler Iron.

1–8 inch weighs	5	lbs. per	sq. ft.
3–16 "	"	7½ "	"
1–4 "	"	10 "	"
5–16 "	"	12½ "	"
3–8 "	"	15 "	"
7–16 "	"	17½ "	"
1–2 "	"	20 "	"

No. 1 Iron is		...5–16	inch thick.
No. 3	"	...9–32	"
No. 4	"	...1–4	"
No. 5	"	...7–32	"
No. 7	"	...3–16	"

Thickness of Boiler Iron Required

AND PRESSURES ALLOWED BY THE LAWS OF THE UNITED STATES.

Pressure equivalent to the Standard for a Boiler 42-in. in diameter and ¼ in thickness.

Thickness in 16ths.	Diameter in inches.						
	34	36	38	40	42	44	46
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
5	169.9	160.4	152.	144.4	137.5	131.2	125.5
4½	158.5	149.7	141.8	134.7	128.3	122.5	117.2
4¼	147.2	139.1	131.8	125.1	119.2	113.7	108.8
4	135.9	128.3	121.6	115.5	110.	105	100.
3⅔	124.5	117.6	111.3	105.9	100.8	96.2	92.
3⅓	113.2	106.9	101.3	96.2	91.7	87.5	83..
3	101.9	96.2	91.2	82.6	82.5	78.7	75..

Number of Burden's Rivets in 100 Lbs.

Length, Inches.	Thickness in inches.				Length, Inches.	Thickness in inches.			
	1–2	5–8	11–16	3–4		1–2	5–8	11–16	3–4
¾	1,092	665			3¼	433	267	212	180
⅞	1,027	597			3½	413	248	201	169
1	940	538	450		3¾	395	241	192	160
1⅛	840	512	415		4		230	184	158
1¼	797	487	389	356	4¼		220	177	150
1⅜	760	460	370	329	4½		210	171	146
1½	730	440	357	280	4¾		200	166	138
1⅝	711	420	340	271	5		190	161	135
1¾	693	390	325	262	5¼		180	156	130
1⅞	648	375	312	257	5½		172	151	124
2	608	360	297	243	5¾		164	145	120
2⅛	573	354	289	237	6		157	140	115
2¼	555	347	280	232	6¼		150	138	111
2⅜	525	335	260	220	6½		146	134	107
2½	500	312	242	208	6¾		143	129	104
3	460	290	224	197	7		140	125	100

IRON CLAD MANUFACTURING CO.

LARGEST MANUFACTURERS OF

Galvanized Sheet-Iron Goods

In the United States, such as

Coal Hods, Ash Cans, Water and Fire Buckets,

GALVANIZED IRON SPRINKLERS,

REFRIGERATOR OR DRIP PANS,

WELL BUCKETS, OIL TANKS, ETC.

Also Manufacturers of the Justly-Celebrated

IRON CLAD MILK CANS

IN NEW YORK, PHILADELPHIA, CINCINNATI, BALTIMORE, CHICAGO, BOSTON AND ST. LOUIS PATTERNS.

GALVANIZED IRON RANGE BOILERS,

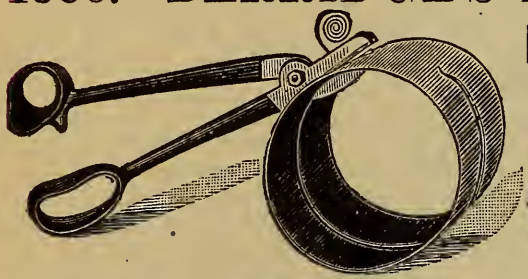
FRY PANS, RIVETS, ETC.

IRON CLAD MANUFACTURING CO.,

22 CLIFF ST., NEW YORK.

1888. BERRIDGE'S IMPROVED 1888.

DOUBLE CUTTING SHEARS.



No. 2. For Tin and Iron. Price, $3.00.

No. 1. For Tin. Price $1.75.

Are now complete with the **Adjustable Jaw** to take up the wear, and **Slotted Bolt Head** used to turn in the edge of pipe.

No Tool Made that will do the Work of the

DOUBLE CUTTING SHEARS.

They are needed every day in the Tin Shop for cutting off old bottoms of **Boilers, Pails, Tea Kettles, etc.,** to be repaired. Also for **Cutting Water Conductor Pipe** and **Repairing Tin Roofs.** They are indispensable in setting up stoves. Metals in sheets can be cut as well as Pipe and Cylinders of every description. They will soon save their cost in a saving of time and stock.

PECK, STOW & WILCOX CO., New York, General Agency.

MANUFACTURED BY

T. BERRIDGE & SON, Sturgis, Mich.

GALVANIZED SHEET IRON.

[*From " The Volta Iron Co.," Pittsburgh, Pa.*]

TABLE, showing Gauges, with Weights per Square Foot; List Price per Pound; Cost per Square Foot at List, together with Cost per Pound and per Square Foot at Different Discounts, ranging from 35 per cent. to 75 per cent.

In this Table prices are calculated to three places of decimals, which is sufficiently accurate for all practical purposes.

Gauge Number		14	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Weight per square foot, oz.		60	48	43	38	33	28	24	21	19	17	16	15	14	13	
List price per pound		.12	.12	.12	.12	.12	.12	.13	.13	.13	.13	.14	.14	.15	.16	
Cost per square foot at List		.45	.36	.323	.285	.248	.21	.195	.171	.154	.138	.14	.131	.131	.13	
Cost at 35 per cent. discount	per lb.	.078	.078	.078	.078	.078	.078	.085	.085	.085	.085	.091	.091	.098	.104	.117
	per sq. ft.	.293	.234	.21	.185	.161	.137	.127	.111	.10	.09	.091	.085	.085	.085	.088
" 37½ " "	per lb.	.075	.075	.075	.075	.075	.075	.081	.081	.081	.081	.088	.088	.094	.10	.113
	per sq. ft.	.281	.225	.202	.178	.155	.131	.122	.107	.096	.086	.088	.082	.082	.081	.084
" 40 " "	per lb.	.072	.072	.072	.072	.072	.072	.078	.078	.078	.078	.084	.084	.09	.096	.108
	per sq. ft.	.27	.216	.194	.171	.149	.126	.117	.102	.093	.083	.084	.079	.079	.078	.081
" 42½ " "	per lb.	.069	.069	.069	.069	.069	.069	.075	.075	.075	.075	.081	.081	.086	.092	.104
	per sq. ft.	.259	.207	.185	.164	.142	.121	.112	.098	.089	.079	.081	.075	.075	.075	.078
" 45 " "	per lb.	.066	.066	.066	.066	.066	.066	.072	.072	.072	.072	.077	.077	.083	.088	.093
	per sq. ft.	.248	.198	.177	.157	.136	.116	.107	.094	.085	.076	.077	.072	.072	.072	.074
" 47½ " "	per lb.	.063	.063	.063	.063	.064	.063	.068	.068	.068	.068	.074	.074	.079	.084	.095
	per sq. ft.	.236	.189	.169	.115	.13	.11	.102	.09	.081	.073	.074	.069	.069	.068	.071
" 50 " "	per lb.	.06	.06	.06	.06	.06	.06	.065	.065	.065	.065	.07	.07	.075	.08	.09
	per sq. ft.	.225	.18	.161	.143	.124	.105	.098	.085	.077	.069	.07	.066	.066	.065	.068
" 52½ " "	per lb.	.057	.057	.057	.057	.057	.057	.062	.062	.062	.062	.067	.067	.071	.076	.086
	per sq. ft.	.214	.171	.153	.135	.118	.10	.093	.081	.073	.066	.067	.062	.062	.062	.064
" 55 " "	per lb.	.054	.054	.054	.054	.054	.054	.059	.059	.059	.059	.063	.063	.068	.072	.081
	per sq. ft.	.203	.162	.145	.128	.111	.095	.088	.077	.065	.062	.063	.059	.059	.059	.061
" 57½ " "	per lb.	.051	.051	.051	.051	.051	.051	.055	.055	.055	.055	.06	.06	.064	.068	.077
	per sq. ft	.191	.153	.137	.121	.105	.089	.083	.073	.066	.059	.06	.056	.056	.055	.057
" 60 " "	per lb.	.048	.048	.048	.048	.048	.048	.052	.052	.052	.052	.056	.056	.06	.064	072
	per sq. ft.	.18	.144	.129	.114	.099	.084	.078	.068	.062	.055	.056	.052	.052	.052	.054
" 62½ " "	per lb.	.045	.045	.045	.045	.045	045	.049	.049	.049	.049	.052	.052	.056	.06	.067
	per sq. ft.	.169	.135	.121	.107	.093	.079	073	.064	.058	.052	.052	.049	.049	.049	.051
" 65 " "	per lb.	.042	.042	.042	.042	.042	.042	.045	.045	.045	.045	049	.049	.052	.056	.063
	per sq. ft.	.157	.126	.113	.1	.087	.073	.068	.06	.054	.048	.049	.046	.046	.045	.047
" 67½ " "	per lb.	.039	.039	.039	039	.039	.039	.042	.042	.042	.042	.045	.045	.049	.052	.058
	per sq. ft.	.146	.117	.105	093	.081	.068	.063	.056	.050	.045	.045	.043	.043	.042	.044
" 70 " "	per lb.	.036	.036	.036	036	.036	.036	.039	.039	.039	.039	.042	.042	.045	.048	.054
	per sq. ft.	.135	.108	097	085	.074	.063	.058	.051	.046	.041	.042	.039	.039	039	.04
" 72½ " "	per lb.	.033	033	.033	033	.033	.033	026	.026	.036	.036	.038	.038	.041	.044	.049
	per sq. ft.	.124	.099	.089	.078	.068	.058	.054	.047	.042	.038	.038	.026	.036	.036	037
" 75 " "	per lb.	.03	.03	.03	03	.03	.03	.032	.032	.032	.032	.035	.035	.037	.04	.045
	per sq. ft.	.112	.09	.081	071	.062	.052	.049	.042	.038	.034	.035	.033	.033	.032	.034

SHEET ZINC.

Zinc Gauge.	Stubs' Wire Gauge.	Weight per Sq. Foot.	Approximate Weight per Sheet. 24 x 84	26 x 84	28 x 84	30 x 84	32 x 84	34 x 84	36 x 84	40 x 84
		oz.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
6	29	7	6 1/8	6 5/8	7 1/8	7 5/8	8 1/4	8 3/4	9 1/4	
7	28 1/2	8	7	7 5/8	8 1/8	8 3/4	9 3/8	9 1/8	10 1/2	
8	28	9	7 7/8	8 1/2	9 1/4	9 7/8	10 1/2	11 1/8	11 3/4	
9	27	10 1/2	9 1/4	10	10 3/4	11 1/2	12 1/4	13	13 3/4	
10	26	12	10 1/2	11 1/2	12	13	14	15	16	
11	25	13 1/2	12	13	14	15	16	17	18	
12	24	15	13	14	15	16 1/2	17 1/2	18 1/2	20	
13	23	17	15	16	17	18 1/2	20	21	22	25
14	22	19	17	18	19 1/2	21	22	23 1/2	25	28
15	21	22	19	21	22 1/2	24	25 1/2	27	29	32
16	20	25	22	24	25 1/2	27	29	31	33	36
17	19	28	25	27	29	31	33	35	37	41
18	18	31	27	30 1/2	32	34	36	38	41	45
19	17	35	31	33	36	38	41	44	46	51
20	16	40	35	38	41	44	47	50	53	59

BAR AND SHEET LEAD.

WEIGHT IN POUNDS.

Thickness, or Diameter, or Side; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.	Thickness, or Diameter, or Side; Inches.	Sheets per Square Foot.	Square Bars 1 Foot Long.	Round Bars 1 Foot Long.
1/16	3.71	.02	.014	1 1/16	63.2	5.6	4.4
1/8	7.43	.079	.06	1 1/8	66.87	6.26	4.91
3/16	11.	.175	.136	1 3/16	70.51	6.98	5.5
1/4	14.08	.31	.245	1 1/4	74.35	7.74	6.1
5/16	18.05	.486	.38	1 5/16	78.05	8.55	6.73
3/8	22.02	.695	.549	1 3/8	81.76	9.38	7.38
7/16	26.	.948	.745	1 7/16	85.48	10.18	8.05
1/2	29.75	1.24	.975	1 1/2	89.28	11.	8.75
9/16	33.49	1.55	1.24	1 9/16	93.	12.05	9.50
5/8	37.18	1.95	1.51	1 5/8	96.78	13.15	10.25
11/16	40.87	2.33	1.85	1 11/16	100.5	14.15	11.06
3/4	44.58	2.8	2.2	1 3/4	104.1	15.18	11.88
13/16	48.28	3.28	2.58	1 13/16	107.8	16.30	12.76
7/8	52.12	3.8	2.98	1 7/8	112.3	17.45	13.66
15/16	56.05	4.35	3.41	1 15/16	116.	18.10	14.61
1	59.48	4.95	3.9	2	119.6	19.78	15.58

SHEET LEAD IS MADE TO WEIGH, PER SQUARE FOOT:
2 1/2, 3, 3 1/2, 4, 4 1/2, 5, 6, 7, 8, 9, 10 pounds, and upwards.

Weight and Dimensions of Wrought Iron Welded Pipes.

FOR GAS, STEAM AND WATER.

Inside Diameter in inches.	Outside Diameter in inches.	Weight per foot in pounds.	Inside Diameter in inches.	Outside Diameter in inches.	Weight per foot in pounds.
⅛	0.40	0.24	3	3.5	7.54
¼	0.54	0.42	3½	4.0	9.05
⅜	0.67	0.56	4	4.5	10.72
½	0.84	0.85	4½	5.0	12.49
¾	1.05	1.12	5	5.56	14.56
1	1.31	1.67	6	6.62	18.77
1¼	1.66	2.25	7	7.62	23.41
1½	1.95	2.69	8	8.62	28.35
2	2.37	3.66	9	9.68	34.07
2½	2.87	5.77	10	10.75	40.64

Lap Welded American Charcoal Iron Boiler Tubes.

TABLE OF STANDARD SIZES.

External Diameter.	External Circumference.	Internal Diameter.	Internal Circumference.	Thickness.	Length of Pipe per sq. ft. of inside surface.	Length of Pipe per sq. ft. of outside surface.	Internal Area.	External Area.	Weight per foot.
Ins.	Ins.	Ins.	Ins.	Ins.	Feet.	Feet.	Ins.	Ins.	lbs.
1	3.142	0.856	2.689	0 072	4.460	3.819	0.575	0.785	0.703
1¼	3.927	1.126	3.474	0.072	3.455	3 056	0 960	1.227	0.9
1½	4.712	1.334	4.191	0.083	2.863	2.547	1.396	1.767	1.250
1¾	5.598	1.560	4.901	0.095	2.448	2.183	1.911	2.405	1.665
2	6.283	1.804	5.667	0.098	2.118	1.909	2.556	2. 42	1.981
2¼	7.069	2.054	6.484	0.098	1.850	1.698	3.314	3.976	2.238
2½	7.854	2.283	7.172	0.109	1.673	1.528	4.094	4 939	2.755
2¾	8.639	2.533	7.957	0.109	1.508	1.390	5.039	5.940	3.045
3	9.425	2.783	8.743	0.109	1.373	1.273	6.083	7.069	3.333
3¼	10.210	3.012	9.462	0.119	1.268	1.175	7.125	8.296	3.958
3½	10.995	3.262	10.248	0.119	1.171	1.091	8.357	9.621	4.272
3¾	11.781	3.512	11.033	0.119	1.088	1.018	9.687	11.045	4 590
4	12.566	3.741	11.753	0.130	1.023	0.955	10.992	12.566	5.320
4½	14.137	4.241	13.323	0.130	0.901	0.849	14.126	15.904	6 01
5	15.708	4.72	14.818	0.140	0.809	0.764	17.497	19.635	7.226
6	18.849	5.699	17.904	0 151	0.670	0.637	25.509	28.274	9.346
7	21.991	6.657	20.914	0.172	0.574	0.545	34.805	38.484	12.435
8	25.132	7.636	23.989	0.182	0.500	0.478	45.795	50.265	15.109
9	28.374	8.615	27.055	0.193	0.444	0.424	58.291	63.617	18.002
10	31.416	9.573	30.074	0.214	0.399	0.382	71.975	78.540	22.19

Light Wrought Iron Artesian Tube and Casing for Oil Wells.

STANDARD SIZES.

Outside Diameter in inches.	Inside Diameter in inches.	Weight per Foot, Pounds.	Outside Diameter, Inches.	Inside Diameter, Inches.	Weight per Foot, Pounds.
1¾	1½	1.665	4¼	4	5.500
2¼	2	2.238	4½	4¼	6.010
2½	2¼	2.755	5	4¾	7.226
2¾	2½	3.045	5¼	5	7.667
3	2¾	3.333	5½	5 3-16	8.033
3¼	3	3.958	6	5⅝	9.346
3½	3¼	4.272	6¼	6¼	10 064
3¾	3½	4.950	7	6¾	12.435
4	3¾	5.320	8	7¾	15.109
			8½	8¼	16.155

MACHINE BOLTS

With Square Heads and Nuts.

Weight of 100, in Pounds.

Diamet'r	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
Length.										
1½	4.	7.	10.5	15.2	22.5	30.	39.5			
1¾	4.3	7.5	11.2	16.3	23.8	31.7	41.6			
2	4.7	8.	12.	17.4	25.1	33.5	43.7	69.	108.	
2¼	5.1	8.5	12.7	18.5	26.4	35.2	45.8	72.	112.2	
2½	5.5	9.	13.5	19.6	27.8	37.	48.	75.	116.5	175
2¾	5.7	9.5	14.2	20.7	29.1	38.7	50.1	78.	121.7	180
3	6.2	10.	15.	21.8	30.4	40.5	52.2	81.	126.	185
3½	7.	11.	16.5	24.	33.1	44.	56.5	87.	134.2	196
4	7.7	12.	18.	26.2	35.7	47.5	60.7	93.1	142.5	207
4½	8.5	13.	19.5	28.4	38.4	51.	65.	99.	151.	218
5	9.2	14.	21.	30.6	41.	54.5	69.2	105.2	159.5	229
5½	10.	15.	22.5	32.8	43.7	58.	73.5	111.2	168.	240
6	10.7	16.	24.	35.	46.3	61.5	77.7	117.3	176.6	251
6½	11.5	17.	25.5	37.2	49.	65.	82.	123.3	185.	262
7	12.2	18.	27.	39.4	51.6	68.5	86.2	129.4	193.6	273
7½	13.	19.2	28.5	41.6	54.3	72.	90.5	135.	202.	284
8	13.7	20.7	30.	43.8	59.6	75.5	94.7	141.5	210.7	295
9			34.	48.2	64.9	82.5	103.2	153.6	227.7	317
10			37.5	52.6	70.2	89.5	111.7	165.7	244.8	339
11			41.	57.	75.5	96.5	120.2	177.8	261.8	360
12			44.5	61.4	80.8	103.5	128.7	189.9	278.9	382
13					86.1	110.5	137.2	202.	295.9	404
14					91.4	117.5	145.7	214.1	313.	426
15					96.7	124.5	154.2	226.2	330.	448
16					102.	131.5	162.7	238.3	347.1	470
17					107.3	138.5	171.	250.4	364.1	492
18					112.6	145.5	179.5	262.6	381.2	514
19					117.9	152.5	188.	274.7	398.2	536
20					123.2	159.5	196.5	286.8	415.3	558

WEIGHT OF 100 BOLT ENDS.

IN POUNDS.

5/16 x 8	18 lbs.	5/8 x12	115 lbs.	1⅛x13	460 lbs.	1⅝x17	1350 lbs.
3/8 x10	34 lbs.	3/4 x12	165 lbs.	1¼x14	630 lbs.	1¾x18	1680 lbs.
7/16 x10	42 lbs.	7/8 x12	230 lbs.	1⅜x15	850 lbs.	1⅞x19	1900 lbs.
½x12	71 lbs.	1 x12	310 lbs.	1½x16	1075 lbs.	2 x20	2300 lbs.

LAG OR WOOD SCREWS.

Weight of 100, in Pounds.

Diamet'r	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
Length.									
1½	4.7	7.1	9.9	13.9					
1¾	5.2	7.6	10.9	14.9					
2	5.7	8.1	11.6	15.8	24.	26.2			
2¼	6.2	8.7	12.5	16.9	25.	27.7			
2½	6.7	9.3	13.4	17.9	26.	29.2	46.5		
3	7.7	10.6	15.1	19.9	28.	33.5	51.5	73.	
3½	8.7	11.9	16.5	22.	31.	36.5	56.5	79.	103.
4	9.7	13.3	18.6	24.3	34.	39.5	61.5	85.	112.
4½	10.7	14.7	20.4	26.9	37.	42.2	67.	91.	121.
5	11.7	16.1	22.1	29.	40.	46.	72.2	97.	130.
5½	12.7	17.5	23.8	31.5	43.	49.4	78.	103.	140.
6	13.7	18.9	25.5	34.	46.	53.	83.5	110.	150.
7			29.2	39.	52.	60.	94.	125.	170.
8			33.	44.	58.	67.5	104.5	140.	190.
9				49.	64.	75.	115.	156.	210.
10				54.	70.	82.5	126.	172.	230.
11					76.	90.	137.	188.	250.
12					82.	98.	148.	204.	270.

GEOMETRICAL DEFINITIONS.

Angle—An opening between two lines that meet in a point.
Right Angle—A straight line perpendicular to another.
Obtuse Angle—An angle wider than a right angle.
Acute Angle—An angle less than a right angle.
Triangle—A figure with three sides and three angles.
Equilateral Triangle—A triangle having all sides equal.
Isosceles Triangle—A triangle having two of its sides equal.
Right-Angled Triangle—A triangle having one right angle.
Obtuse-Angled Triangle—A triangle having one obtuse angle.
Quadrangle or Quadrilateral is a four-sided figure and may be a parallelogram, having its opposite sides paralleled.
Square—Having all its sides equal and all right angles.
Rectangle—Having a right angle.
Rhombus or Lozenge—Having all sides equal and no right angles.
Rhomboid—A parallelogram with no right angles.
Trapezoid—Having only two sides parallel.
Polygon—A plain figure having more than four sides.
Pentagon—Having five sides.
Hexagon—Having six sides.
Heptagon—Having seven sides.
Octagon—Having eight sides.
Nonagon—Having nine sides.
Decagon—Having ten sides.
Radius is a line extending from the center to the circumference. It is one-half of any given diameter.

Rails, Splices and Bolts Required for One Mile of Track.

Tons of Rails.

Rule—To find the number of tons (of 2,240 lbs.) of Rail to the mile, divide the weight per yard by 7, and multiply it by 11, thus: for 56 lb. rail divide 56 by 7, equal 8, multiplied by 11, equal 88 tons, for one mile of single track.

Weight of Rail, per yard.	Tons per Mile.	Weight of Rail, per yard.	Tons per Mile.
12 pounds.	12 tons 920 pounds.	45 pounds.	70 tons 1600 p'nds.
14 "	22 "	48 "	75 " 960 "
16 "	25 " 320 "	50 "	78 " 1280 "
18 "	28 " 640 "	52 "	81 " 1600 "
20 "	31 " 960 "	56 "	88 "
22 "	34 " 1280 "	57 "	89 " 1280 "
25 "	39 " 640 "	60 "	94 " 640 "
26 "	40 " 1920 "	62 "	37 " 960 "
27 "	42 " 960 "	64 "	100 " 1280 "
28 "	44 "	65 "	102 " 320 "
30 "	47 " 320 "	68 "	106 " 1920 "
33 "	51 " 1920 "	70 "	110 "
35 "	55 "	72 "	113 " 320 "
40 "	62 " 1920 "	76 "	119 " 960 "

Number of Rails, Chairs, Joints, Splices and Bolts.

Length of Rail.	No. of Rails, Chairs or Joints.	No. of Splices.	No. of Bolts.
18	584	1,168	2,336
20	528	1,056	2,112
21	503	1,006	2,012
22	480	960	1,920
24	440	880	1,760
25	422	844	1,688
26	406	812	1,624
27	391	782	1,564
28	377	754	1,508
30	352	704	1,408

No allowance made for side track in above tables.

Number of Cross Ties for each Mile of Track.

Centre to Centre.	No. of Ties.	Centre to Centre.	No. of Ties
1½ feet.....	3,520	2½ feet.....	2,113
1¾ "	3,017	2¾ "	1,921
2 "	2,640	3 "	1,761
2¼ "	2,348		

Capacity of a Freight Car.

A load is nominally 10 tons of 20,000 lbs. The following can be carried: Whiskey, 60 bbls.; salt, 70 bbls.; lime, 70 bbls.; flour, 90 bbls.; eggs, 130 to 160 bbls.; flour 200 sacks; wood, 6 cords; cattle, 18 to 20 head; hogs, 50 to 60; sheep, 80 to 100; lumber, 6,000 feet; barley, 300 bushels; wheat, 340 bushels; flax seed, 360 bushels; apples, 370 bushels; corn, 400 bushels; potatoes, 430 bushels; oats, 680 bushels; bran, 1,000 bushels; butter, 20,000 lbs.

Weight of a Lineal Foot of Flat Steel in lbs.

Inch.	1/8	1/4	3/8	1/2	5/8	3/4	1
1/2	.213	.426	.64	...	...	...	..
5/8	.266	.533	.8	1.066	...	...	...
3/4	.319	.639	.959	1.28	1.6	...	...
1	.426	.853	1.28	1.706	2.133	2.559	...
1 1/8	.48	.959	1.439	1 919	2.399	2.879	3.84
1 1/4	.533	1.066	1.6	2.133	2.666	3.200	4.266
1 3/8	.586	1.173	1.759	2.346	2.933	3.519	4 693
1 1/2	.639	1.279	1.919	2.56	3.199	3.84	5.119
1 5/8	.693	1.386	2.079	2.773	3.466	4.16	5.546
1 3/4	.746	1.493	2.24	2.986	3.733	4 479	5.973
2	.853	1.706	2.559	3.413	4.266	5.119	6.826
2 1/8	.906	1.813	2.719	3.626	4.533	5.439	7.253
2 1/4	.96	1.919	2.879	3.84	4.799	5.76	7.68
2 3/8	1.013	2.026	3.039	4.053	5.066	6.079	8.106
2 1/2	1.016	2.133	3.199	4.266	5.333	6.399	8.533
2 5/8	1.019	2.24	3.36	4.48	5.6	6.72	8.96
2 3/4	1.173	2.346	3.519	4.693	5.866	7.039	9.386
3	1.28	2.56	3.84	5.12	6.4	7.68	10.24
3 1/4	1.386	2.773	4.16	5.546	6.933	8.319	11.093
3 1/2	1.493	2.986	4.48	5.973	7.466	8.95	11.946
3 3/4	1.6	3.199	4.799	6.399	7.999	9.599	12.799
4	1.706	3.413	5.119	6.826	8.533	10.239	13.653
4 1/4	1.813	3.626	5.439	7.253	9.066	10.879	14.506
4 1/2	1.92	3.84	5.76	7.68	9.6	11.52	15.36
4 3/4	2.026	4.053	6.079	8.106	10.133	12.159	16.213
5	2.133	4.266	6.399	8.533	10.666	12.799	17.066
5 1/4	2.24	4.48	6.72	8.959	11.199	13.44	17.919
5 1/2	2.346	4.693	7.039	9.386	11.733	14.079	18.773
5 3/4	2.453	4.906	7.359	9.813	12.266	14.719	19.626
6	2.56	5.12	7.68	10.24	12.8	15.36	20.48

Number of Brass Escutcheon Pins in a Pound.

	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2
12	.....	720	650	460	416	400	336	272	212	192	170
13	.....	1,120	948	672	528	480	400	380	320	229	220
14	1,875	1,312	1,100	950	830	692	600	432	378	320	272
15	2,440	1,820	1,376	1,152	960	888	720	576	580	432	400
16	3,100	2,240	1,720	1,460	1,275	1,130	980	720	592	578	464
17	3,540	2,700	2,076	1,812	1,500	1,185	1,051	928	800	640	.....
18	4,972	3,175	2,550	2,450	2,200	1,740	1,520	1,216	960	.....	.....
19	7,303	5,140	4,130	3,565	2,900	.....	.....	.....	.....	.....	.....
20	9,932	8,419	6,374	5,500	4,155	.....	.....	.....	.....	.....	.....

WEIGHT OF ONE FOOT OF BAR STEEL.

ROUND.		SQUARE.		OCTAGON.	
Diam. In.	Lbs.	Side In.	Lbs.	Diam. In.	Lbs.
¼	.166	¼	.213	¼	.84
⅜	.375	⅜	.479	⅝	1.23
½	.667	½	.855	¾	1.75
⅝	1.04	⅝	1.33	⅞	2.25
¾	1.50	¾	1.91	1	2.75
⅞	2.05	⅞	2.61	1⅛	3.66
1	2.67	1	3.40	1¼	4.55
1⅛	3.38	1⅛	4.34	1⅜	5.50
1¼	4.17	1¼	5.22	1½	6.45
1⅜	5.05	1⅜	6.44	1⅝	7.75
1½	6.00	1½	7.67	1¾	9.20
1⅝	7.05	1⅝	9.00	1⅞	10.04
1¾	8.17	1¾	10.44	2	11.60
1⅞	9.38	1⅞	11.98	2⅛	13.14
2	10.68	2	13.63	2¼	14.75
2⅛	12.04	2⅛	15.35	2¾	16.40
2¼	13.51	2¼	17.20	2½	17.85
2⅜	15.05	2⅜	19.17	2⅝	19.50
2½	16.68	2½	21.20	2¾	21.25
2⅝	18.43	2⅝	23.30	2⅞	22.69
2¾	20.19	2¾	25.70	3	25.00
2⅞	22.00	2⅞	27.74		
3	24.03	3	30.60		
3⅛	26.12	3⅛	33.18		
3¼	28.20	3¼	35.90		
3⅜	30.45	3⅜	38.78		
3½	32.70	3½	41.65		
3⅝	35.12	3⅝	44.17		
3¾	37.54	3¾	46.70		
4	42.71	4	54.40		
4¼	48.22	4¼	61.40		
4½	54.06	4½	68.85		
5	66.75	5	85.00		

GENUINE RUSSIA SHEET IRON.

	SIZE.	WEIGHT PER SHEET.	WIRE GAUGE.
No. 7..	28x56 in.	6¼ lbs.	No. 29
No. 8.....	"	7¼ lbs.	No. 28
No. 9.....	"	8 lbs.	No. 27
No. 10.....	"	9 lbs.	No. 26
No. 11.....	"	10 lbs.	No. 25
No. 12.....	"	10¾ lbs.	No. 24½
No. 13.....	"	11¾ lbs.	No. 24
No. 14.....	"	12½ lbs.	No. 23¼
No. 15.....	"	13½ lbs.	No. 22⅜
No. 16.....	"	14½ lbs.	No. 21½

Average weight per bundle, 240 pounds.

AMERICAN (IMITATION) RUSSIA SHEET IRON.

No. Wire Gauge.	Size sheets—inches.	Wt. per sheet, lbs.
24	28x60	11½
25	28x60	10½
26	28x60	9¾
27	28x60	9¼

Tempering Steel.

(*Haswell.*)

Steel in its hardest state being too brittle for most purposes, the requisite strength and elasticity are obtained by tempering—or *letting down the temper* as it is termed—which is performed by heating the hardened steel to a certain degree and cooling it quickly. The requisite heat is usually ascertained by the color which the surface of the Steel assumes from the film of oxide thus formed.

The degrees of heat to which these several colors correspond are as follows:

At 430, a very faint yellow.	Suitable for hard instruments; as hammer-faces, drills, &c.
At 450, a pale straw color..	
At 470, a full yellow.....	For instruments requiring hard edges without elasticity; as shears, scissors, turning tools, &c
At 490, a brown color.....	
At 510, brown, with purple spots.....	For tools, for cutting wood and soft metals; such as plane-irons, knives, &c.
At 530, purple.....	
As 550, dark blue.....	For tools requiring strong edges, without extreme hardness; as cold-chisels, axes, cutlery, &c.
At 560, full blue.....	
At 600, grayish blue, verging on black.....	For spring-temper, which will bend before breaking; as saws, sword-blades, &c.

If the steel is heated higher than this, the effect of the hardening process is destroyed.

It Has Been Stated

That the temperature of furnaces &c., may be estimated with considerable accuracy by the color of the fire, and that with a little practice the error at very high temperatures will not exceed 90°, or 100°, and the following table contains the result of observations with an air thermometer:

Color of Fire.	Temperature, Degrees F.
Red, just visible.....	977
" dull.....	1,290
" cherry, dull.....	1,470
" " full.....	1,650
" " clear.....	1,830
Orange, deep.....	2,010
" clear.....	2,190
White heat.....	2,370
" bright.....	2,550
" dazzling.....	2,730

Effect of Heat on Various Bodies.

	Degrees
Ammonia boils.....	140
Ammonia (liquid) freezes.....	—46
Antimony melts.....	951
Arsenic melts.....	365
Bismuth melts.....	476
Blood (human) heat of.....	98
" " freezes.....	25
Brandy freezes.....	—7
Brass melts.....	1,900
Cadmium melts.....	600
Coal Tar boils.....	325
Cold, greatest artificial.....	—166
" greatest natural.....	—56
Common Fire.....	790
Copper melts.....	2,548
Glass melts.....	2,377
Gold (fine) melts.....	2,590
Gutta-percha softens.....	145
Heat, cherry red.....	1,500
" " (Daniel).....	1,141
" bright red.....	1,860
" red, visible by day.....	1,077
" white.....	2,900
Ice melts.....	32
Iron (cast) melts.....	3,479
" (wrought) melts.....	3,980
Iron, bright red in the dark...	752
" red hot in twilight.....	884
Lead melts.....	504
Mercury boils.....	662
" volatilizes.....	680
" freezes.....	—39
Naphtha boils.....	186
Petroleum boils.....	306
Platinum melts.....	3,080
Potassium melts.....	135
Proof Spirit freezes.....	—7
Saltpetre melts.....	600
Sea-water freezes.....	28
Silver (fine) melts.....	1,250
Snow and Salt, equal parts.	0
Spirits of Terpentine freezes.	14
Steel melts.....	2,500
" polished, blue.....	580
" straw color.....	460
Strong Wines freeze.....	20
Sulphur melts.....	226
Sulph Acid (sp. grav 1,641) freezes	—45
Tin melts.....	421
Vinous fermentation.....60 to	77
Water in *vacuo* boils.....	98
Zinc melts.....	740

The sign — before the figures indicates that many degrees below zero or 0.

PATENT EYE SASH WEIGHTS

SALES IN 1887, 3188 TONS.



W. A. Ross & Brother, 56 Pine St., New York.

SEE LIST ON OPPOSITE PAGE.

RAYMOND LEAD CO.,

Lake and Clinton Streets, Chicago, Ill.

MANUFACTURERS OF

SHOT, LEAD PIPE AND SHEET LEAD

—AND—

COMPRESSED LEAD SASH WEIGHTS.

SOLID.

COMPACT.

NOISELESS.

Orders Filled at Sight. Send for Circulars and Prices.

BUILDERS' REFERENCE TABLES.

Size of Glass in Windows.			Size of Sash and Frame.	Weights.	
12 Lights.	8 Lights.	4 Lights.		1¼	1½
				Lbs.	Lbs.
8x10	12 x10	12 x20	2.4 x3.10	4	5
8x12	12 x12	12 x24	2.4 x4.6	4½	5
9x12	13½x12	13½x24	2.7 x4.6	5	5½
9x13	13½x13	13½x26	2.7 x4.10	5½	5½
9x14	13½x14	13½x28	2.7 x5.2	5½	6
9x15	13½x15	13½x30	2.7 x5.6	5½	6½
9x16	13½x16	13½x32	2.7 x5.10	6	6½
10x12	15 x12	15 x24	2.10x4.6	5½	6
10x14	15 x14	15 x28	2.10x5.2	6	6½
10x15	15 x15	15 x30	2.10x5.6	6	7
10x16	15 x16	15 x32	2.10x5.10	6½	7½
10x18	15 x18	15 x36	2.10x6.6	7	8
10x20	15 x20	15 x40	2.10x7.2	8	9
11x14	16½x14	16½x28	3.1 x5.2	6	7
11x15	16½x15	16½x30	3.1 x5.6	6½	7½
11x16	16½x16	16½x32	3.1 x5.10	7	8
11x17	16½x17	16½x34	3.1 x6.2	7	8
11x18	16½x18	16½x36	3.1 x6.6	7½	8½
12x14	18 x14	18 x28	3.4 x5.2	6½	7½
12x15	18 x15	18 x30	3.4 x5.6	7	8
12x16	18 x16	18 x32	3.4 x5.10	7½	8½
12x18	18 x18	18 x36	3.4 x6.6		9½
12x20	18 x20	18 x40	3.4 x7.2		10½
12x24	18 x24	18 x48	3.4 x8.6		12

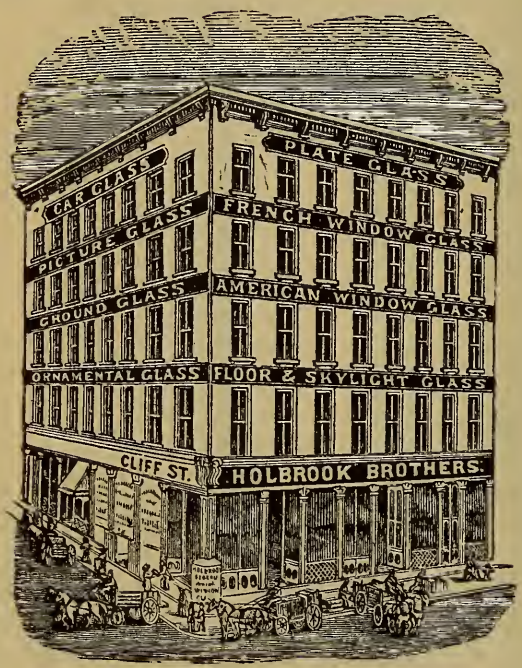
One Hank of Sash Cord will hang 16 Weights. Each Hank Measures 75 feet and weighs about 2 1-4 lbs.

SASH WEIGHTS.—Standard Size List.

Lbs.	Inches diam'r	Inches length	Lbs.	Inches diam'r	Inches length	Lbs.	Inches diam'r	Inches length
2	1 1/8	8¼	9	1 9/16	18	18	1⅞	25½
2½	1 1/8	10	9½	1 9/16	19½	19	2	24½
3	1 3/16	11	10	1 5/8	19	20	2	25½
3½	1 5/16	11	10½	1 5/8	19¾	21	2	27½
4	1 5/16	12	11	1 5/8	20⅜	22	2	28
4½	1 5/16	13	11½	1 5/8	19	23	2	30
5	1 7/16	13	12	1 3/4	20	24	2	31
5½	1 7/16	14	12½	1 3/4	21	25	2	32
6	1 7/16	14½	13	1 3/4	22	26	2	33
6½	1 7/16	15¼	14	1 3/4	23½	27	2	35
7	1 7/16	16¼	15	1 3/4	25	28	2	37
7½	1 ½	17	16	1 7/8	23¼	29	2	38
8	1 ½	17¾	17	1 7/8	24½	30	2	39½
8½	1 9/16	17¾						

2-lb. to 20-lb. Patent Eye. 21-lb. to 30-lb. Solid Eye.
Sizes not on List, and Square Weights, half-cent per lb. extra.

WINDOW GLASS.



IMPORTERS —

ENGLISH and FRENCH PLATE GLASS,
FRENCH WINDOW GLASS.
FRENCH PICTURE GLASS.
FRENCH CAR GLASS.
ENAMELED GLASS,
GROUND GLASS,
CATHEDRAL GLASS.
RUBY, BLUE, GREEN, ORANGE and PURPLE GLASS.

SHARRATT & NEWTH'S ENGLISH GLAZIERS' DIAMONDS.

—ALSO—

American Plate Glass. *American Window Glass.*
Floor and Skylight Glass. *Embossed and Cut Glass.*

All kinds of Glass Cut to any Size and Shape required. Estimates furnished.

HOLBROOK BROTHERS,

87 & 89 Beekman, and 53 & 55 Cliff Streets,
NEW YORK CITY.

WINDOW GLASS.

FRENCH OR AMERICAN.

No. of Lights per Box of 50 Feet.

6	by 8	150	13	by 20	28	16	by 54	8	24	by 30	10
6½	" 8½	130	13	" 22	25	16	" 60	8	24	" 32	10
7	" 9	115	13	" 24	23	18	" 20	20	24	" 34	9
8	" 10	90	13	" 26	21	18	" 20	18	24	" 36	9
8½	" 10½	81	13	" 28	20	18	" 24	17	24	" 38	8
8	" 11	82	13	" 30	19	18	" 26	16	24	" 40	8
8	" 12	75	13	" 32	17	18	" 28	14	24	" 42	7
9	" 11	73	14	" 15	34	18	" 30	14	24	" 46	7
9	" 12	67	14	" 16	32	18	" 32	13	24	" 48	6
9	" 13	62	14	" 17	31	18	" 34	12	24	" 50	6
9	" 14	57	14	" 18	29	18	" 36	11	24	" 54	6
9	" 15	53	14	" 20	26	18	" 38	11	24	" 55	5
9	" 16	50	14	" 22	24	18	" 40	10	24	" 60	5
9	" 18	45	14	" 24	22	18	" 42	10	24	" 66	5
10	" 12	60	14	" 26	20	18	" 44	9	26	" 28	10
10	" 13	55	14	" 28	19	18	" 46	9	26	" 30	9
10	" 14	52	14	" 30	17	18	" 50	8	26	" 32	9
10	" 15	48	14	" 32	16	18	" 52	8	26	" 34	8
10	" 16	45	14	" 34	15	18	" 56	7	26	" 36	8
10	" 17	43	14	" 36	14	18	" 60	7	26	" 38	7
10	" 18	40	14	" 38	14	20	" 22	16	26	" 42	7
10	" 20	36	14	" 40	13	20	" 24	15	26	" 44	6
10	" 22	33	14	" 42	12	20	" 26	14	26	" 48	6
10	" 24	30	14	" 44	12	20	" 28	13	26	" 50	6
10	" 26	28	14	" 46	11	20	" 30	12	26	" 52	5
10	" 28	26	15	" 16	30	20	" 32	11	26	" 54	5
10	" 30	24	15	" 18	27	20	" 34	11	26	" 58	5
11	" 12	55	15	" 20	24	20	" 36	10	26	" 60	5
11	" 13	51	15	" 22	22	20	" 38	10	28	" 30	9
11	" 14	47	15	" 24	20	20	" 40	9	28	" 32	8
11	" 15	44	15	" 26	19	20	" 42	9	28	" 34	8
11	" 16	41	15	" 28	17	20	" 44	8	28	" 36	7
11	" 17	39	15	" 30	16	20	" 48	8	28	" 40	7
11	" 18	37	15	" 32	15	20	" 50	7	28	" 42	6
11	" 20	33	15	" 34	14	20	" 54	7	28	" 46	6
11	" 22	30	15	" 36	13	20	" 58	6	28	" 50	5
11	" 24	27	15	" 38	13	20	" 64	6	28	" 56	5
12	" 13	46	15	" 40	12	22	" 24	14	28	" 60	4
12	" 14	43	16	" 16	28	22	" 26	13	28	" 66	4
12	" 15	40	16	" 18	25	22	" 28	12	30	" 30	8
12	" 16	38	16	" 20	23	22	" 30	11	30	" 32	8
12	" 17	35	16	" 22	21	22	" 32	10	30	" 34	7
12	" 18	34	16	" 24	19	22	" 34	10	30	" 38	7
12	" 20	30	16	" 26	17	22	" 36	9	30	" 40	6
12	" 22	27	16	" 28	16	22	" 38	9	30	" 44	6
12	" 24	25	16	" 30	15	22	" 40	8	30	" 46	5
12	" 26	23	16	" 32	14	22	" 42	8	30	" 48	5
12	" 28	22	16	" 34	13	22	" 44	7	30	" 50	5
12	" 30	20	16	" 36	13	22	" 48	7	30	" 52	5
12	" 32	19	16	" 38	12	22	" 50	7	30	" 54	4
12	" 34	18	16	" 40	11	22	" 52	6	30	" 56	4
12	" 36	17	16	" 42	11	22	" 56	6	30	" 60	4
13	" 14	40	16	" 44	10	22	" 60	5	30	" 64	4
13	" 15	37	16	" 46	10	24	" 24	12	30	" 66	4
13	" 16	35	16	" 48	9	24	" 26	12	30	" 70	3
13	" 18	31	16	" 52	9	24	" 28	11	32	" 34	7

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34	" 56	4									
34	" 60	4									
34	" 66	3									
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44	" 50	3									
44	" 56	3									
46	" 54	3									
46	" 64	3									

A. B. & W. T. WESTERVELT,

102 Chambers Street,

Corner Church Street, NEW YORK,

— MANUFACTURERS OF —

Ornamental Iron, Copper and Zinc Work.

COPPER WEATHER VANES AND BANNERETS,

NEWEST AND MOST APPROVED DESIGNS.

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DOOR AND WINDOW

GUARDS.

PLAIN AND ORNAMENTAL

Driveway Gates.

WIRE WORK

of every description for Banks, Offices, &c.

Lamps and Lamp Posts.

FOUNTAINS.

AQUARIA.

FOUNTAIN JETS.

Garden Vases.

STATUARY.

Chairs and Settees.

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COPPER AND GALVANIZED IRON

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CAST IRON

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AND

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For Houses, Churches, Towers and Public Buildings.

Hand and Horse Lawn Mowers and Garden Rollers.

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Iron Brass and Nickel Plated Stable Fittings,

SUCH AS

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Mangers,
Racks,
Gutters,
Posts,

Hocks, Tie Rings,
Water Troughs,
Wood Covered Brackets,
Whip Racks, &c. &c.

Special attention given to Architects' Drawings.

Illustrated Catalogues furnished to Architects, Builders, and the Trade.

Office & Warerooms, 102 CHAMBERS ST., cor. Church, New York.

ROOFING SLATE.

GENERAL RULE FOR THE COMPUTATION OF SLATE.

From the length of the slate take three inches, or as many as the third covers the first; divide the remainder by 2, and multiply the quotient by the width of the slate, and the product will be the number of square inches in a single slate. Divide the number of square inches thus procured by 144, the number of square inches in a square foot, and the quotient will be the number of feet and inches required. A square of slate is what will cover 100 feet square, when properly laid upon the roof.

TABLE OF SIZES AND NUMBER OF SLATES IN ONE SQUARE.

Size in Inches.	No. of Slate in a Square.	Size in Inches.	No. of Slate in a Square.	Size in Inches	No. of Slate in a Square.	Size in Inches.	No. of Slate in a Square.
6x12	533	9x14	291	10x18	192	11x22	137
7x12	457	10x14	261	11x18	174	12x22	125
8x12	400	12x14	218	12x18	160	14x22	108
9x12	355	8x16	277	14x18	137	12x24	114
10x12	320	9x16	246	10x20	169	14x24	98
12x12	266	10x16	221	11x20	154	16x24	86
7x14	374	12x16	185	12x20	141	14x26	89
8x14	327	9x18	213	14x20	121	16x26	78

The weight of a square of Slate is estimated in a general way (varying according to the thickness of the different makes) at from 600 to 700 lbs. per square.

A *square* of Slate is 100 superficial feet.

Gauge is distance between the courses of the slates.

Lap is distance which each slate overlaps the slate lengthwise next but one below it, and it varies from 2 to 4 inches. The standard is assumed to be 3 inches.

Margin is width of course exposed or distance between tails of slate.

Pitch of a slate roof should not be less than 1 in height to 4 in breadth.

Length of a slate is taken from nail-hole to tail.

Thickness of slates ranges from $\frac{1}{8}$ to $\frac{5}{16}$ inch.

WEIGHT PER SQUARE FOOT.

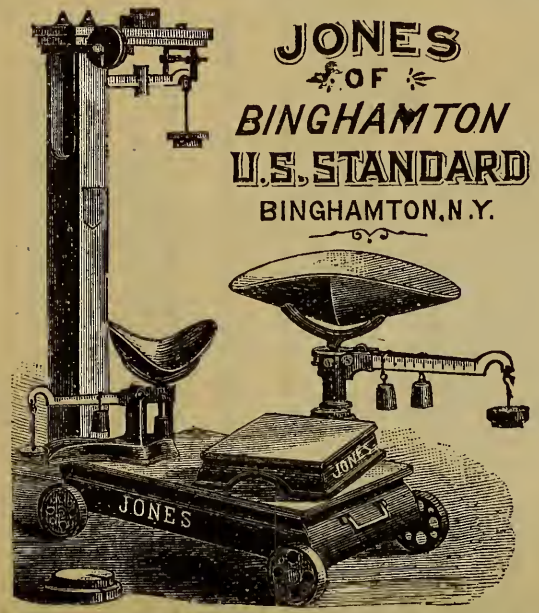
Thickness.....	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1
Weight.....	1.81	2.71	3.62	5.43	7.25	9.06	10.87	14.5 lbs.

Weight per cubic foot, 174 pounds.

It requires, on account of laps, an average of nearly $2\frac{1}{2}$ *square feet* of slate to make one of slating.

"JONES, HE PAYS THE FREIGHT."

The Best and the Cheapest.



We are devoting especial attention to the demands of the Hardware Trade and we solicit your application for prices.

JONES OF BINGHAMTON

BINGHAMTON, N. Y.

THE ACME OF UTILITY AND ECONOMY IN STORE SHELVING.

KOCH'S PATENT ADJUSTABLE SHELF REVERSIBLE BRACKETS.

SHELVING CAN BE READILY PUT UP BY ANY ONE AND MOVED AS EASILY AS STOCK

ONE BRACKET SUITABLE FOR VARIOUS WIDTHS OF SHELVING.

Patented Oct. 19, 1886.

LIBERAL DISCOUNT TO THE TRADE.

SPECIAL INDUCEMENTS

To parties first putting up these Brackets in any locality. Address

KOCH A. B. CO., MFRS.,

361 Main Street, Peoria, Ill.

Number of Slate in any Number of Squares

CAN BE CALCULATED FROM THE FOLLOWING TABLE.

The left-hand column is size of slate; the figures at the top are the number of squares; the columns of figures are the number of pieces of slate.

—6	½ SQ.	1 SQ.	2 SQ.	3 SQ.	4 SQ.	5 SQ.	6 SQ.	7 SQ.	8 SQ.	9 SQ.	10 SQ.	11 SQ.	12 SQ.	13 SQ.	14 SQ.
24x1	43	85	171	258	343	428	515	600	685	772	857	943	1029	1115	1200
24x1¼	49	98	196	294	392	490	588	686	783	881	979	1077	1175	1273	1371
24x1½	58	115	229	343	457	571	686	800	914	1029	1143	1257	1371	1485	1600
22x1¼	54	108	217	325	434	542	650	758	866	975	1083	1191	1300	1408	1516
22x1½	63	126	253	379	505	631	758	884	1011	1137	1263	1389	1515	1642	1768
22x11	69	137	276	413	551	689	826	965	1102	1240	1378	1515	1653	1791	1929
20x14	61	121	242	363	484	605	726	847	968	1089	1210	1331	1452	1573	1694
20x12	71	141	282	424	565	706	847	988	1129	1271	1412	1552	1694	1835	1976
20x11	77	154	308	462	616	770	924	1078	1232	1386	1540	1694	1848	2002	2156
20x10	85	170	339	508	678	847	1017	1186	1356	1525	1694	1863	2032	2202	2371
18x12	80	160	320	480	640	800	960	1120	1280	1440	1600	1760	1920	2080	2240
18x10	96	192	384	576	768	960	1152	1344	1536	1728	1920	2112	2304	2496	2688
18x 9	107	213	426	640	853	1066	1280	1493	1706	1920	2133	2346	2560	2773	2986
10x12	93	185	370	554	739	924	1108	1293	1477	1662	1847	2031	2216	2400	2585
10x10	111	222	443	664	886	1107	1329	1550	1772	1993	2215	2436	2658	2880	3101
10x 9	123	246	492	738	985	1231	1477	1723	1969	2215	2461	2707	2953	3200	3446
10x 8	138	276	554	831	1108	1385	1662	1938	2215	2492	2769	3046	3323	3600	3876
14x14	94	187	374	561	748	935	1122	1309	1496	1683	1870	2057	2244	2431	2618
14x12	109	218	437	654	872	1091	1310	1527	1745	1963	2182	2400	2618	2836	3054
14x10	131	262	524	785	1048	1309	1570	1833	2094	2356	2618	2880	3141	2403	3665
14x 9	145	290	581	872	1163	1454	1745	2036	2326	2618	2909	3200	3490	3781	4072
14x 8	164	327	655	982	1309	1636	1964	2291	2618	2946	3273	3600	3927	4254	4581
14x 7	187	374	748	1122	1496	1870	2244	2618	2992	3366	3740	4114	4488	4862	5236
12x12	134	267	534	800	1067	1334	1600	1867	2133	2400	2667	2934	3200	3467	3734
12x10	160	320	640	960	1280	1600	1920	2240	2559	2879	3200	3520	3840	4160	4480
12x 8	200	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600
12x 7	229	457	914	1371	1828	2285	2743	3200	3657	4114	4571	5028	5485	5942	6399
12x 6	267	533	1067	1600	2134	2667	3200	3734	4267	4800	5334	5867	6400	6934	7437

Standard Rules for Measuring Slate Roofing.

These rules are recognized and followed by roofers and architects wherever slate-roofing is used, and in all standard works on the subject: FOR PLAIN ROOF—Measure the length of the roof and multiply by the length of the rafter. FOR ROOF WITH HIPS, VALLEYS, GABLES, DORMERS' ETC.—Measure each section through center and multiply length of rafter; and, in addition to the actual surface of roof, measure the length of all hips and valleys by one foot wide. The extra measure on hips and valleys is intended to compensate for extra labor and loss of material in cutting, fitting and laying same. No deduction is made for dormer windows, skylights, chimneys, etc., unless they measure more than four feet square. If more than four feet square and less than eight feet square, deduct one-half. If more than eight feet square, deduct the whole. If hips are mitred, charge extra. The carpenter should furnish cant strips.

CLIFF'S R. H. WAGON SPRINGS.

1888 STYLE.

SHOWING APPLICATION TO BOLSTER.

PRICE LIST:

1000 Lbs. Capacity...$4.75 *3000 Lbs. Capacity...$7.00*
1500 Lbs. Capacity...$5.00 *4000 Lbs. Capacity...$8.00*
2000 Lbs. Capacity...$6.00 *6000 Lbs. Capacity...$10.00*
8000 Lbs. Capacity.....$12.00.

Cliff's R. H. Wagon Bolster Springs

ARE THE BEST IN THE WORLD.

They are made of **Best Crucible Steel.**

They are **All Complete,** ready to drop onto the wagon.

They are **Adjustable to any Width** of Bolster.

They have the **Slow, Easy Motion** that is absolutely necessary to carry fruits and produce in perfect condition.

They **Will Save 20 Per Cent** in wear and tear on wagon and team.

Every Set of Springs will carry its marked capacity.

Springs are **Warranted Against Defects** of material and workmanship.

SOLD EVERYWHERE.

TITUS & BABCOCK,

Manufacturers' Agents, - Rochester, N. Y.

POWDER AND SAFETY FUSE.

SPORTING POWDER is packed in 5 sizes of grain running from F (coarsest), FF, FG, FFG, FFFG (finest), the sizes in greatest demand being FG and FFG.

BLASTING POWDER.—"*A Blasting*" is packed in 8 sizes of grain, TP (coarsest), TPG, F, FF, FG, FFG, FFFG, FFFFG (finest), the last size being especially adapted for use in Granite quarries.

"*B Blasting*" has 6 sizes of grain, C (coarsest), TP, TPG, F, FF, FFF (finest). It is *glazed* unless otherwise ordered.

SHIPPING POWDER (*extra strength*) is packed in six sizes of grain, TPG (coarsest), F, FF, FG, FFG, FFFG (finest).

SAFETY FUSE

Is of 8 qualities: Hemp, Cotton, Superior Mining, Single-Taped, Double-Taped, Triple-Taped, Small Gutta Percha, Large Gutta Percha, the qualities in greatest demand being Cotton and Single-Taped.

12 inches of Hemp Fuse will burn out in about 9 seconds.
12 " Cotton Fuse " " 15 "
12 " Single-Taped Fuse " " 18 "
12 " Double-Taped Fuse " " 20 "

Taped Fuse is made to resist influence of water and severe tamping.

Safety Fuse is packed in barrels, each barrel containing a uniform number of feet, *viz.*:

Cotton Fuse.....14,000 feet in each barrel.
Hemp.....10,000 " "
Single-Tape Fuse..... 8,000 " "
Double-Tape Fuse..... 7,000 " "
Triple-Tape Fuse..... 5,000 " "

ATLAS POWDER.

Put up in cartridges of either 6 or 8 inches in length, and from ⅞ of an inch to 2 inches in diameter, and packed in 25-lb., 50-lb. short and 50-lb. long boxes (the last, for convenience in handling, contain the powder in five 10-lb. paper boxes placed inside of the wood box.)

Boxes marked **E** contain 20 per cent. Nitro-Glycerine Powder
" " **E-D** " 25 " " " "
" " **D** " 30 " " " "
" " **D-C** " 35 " " " "
" " **C** " 40 " " " "
" " **C-B** " 45 " " " "
" " **B** " 50 " " " "
" " **B-A** " 60 " " " "
" " **A** " 75 " " " "

Taking "Atlas C Powder" as a standard, a single cartridge of that grade will weigh in ounces, according to its diameter and length, as follows:

Size of Cartridge	Weight in Ounces of each Cartridge.	Size of Cartridge.	Weight in Ounces of each Cartridge.
⅞ × 6	3½	⅞ × 8	4¼
× 6	4½	1 × 8	5¼
1⅛ × 6	5⅝	1⅛ × 8	6⅞
1¼ × 6	6¾	1¼ × 8	8
1⅜ × 6	9⅞	1⅜ × 8	12¼
1¾ × 6	13½	1¾ × 8	16
2 × 6	16⅔	2 × 8	20

NOTE.—For low r grades, reduce weight of Cartridge; for higher grades increase weight of cartridge.

WORKSHOP RECIPES.

Cement to Resist Fire and Water, and Harden Quickly.

Two parts finely sifted unoxodized iron filings.
One part, perfectly dry, finely powdered loam.
Knead the mixture with strong vinegar into a homogeneous plastic mass, to be used as soon as made.

To Soften Putty.

To remove old putty from broken windows, dip a small brush in nitro-muriatic acid or caustic soda (concentrated lye), and with it annoint or paint over the dry putty that adheres to the broken glass and frames of your windows; after an hours interval, the putty will have become so soft as to be easily removable.

Painter's Putty.

Spanish whiting, pulverized.....	80.6	Made into a stiff paste. If not intended for immediate use, raw oil should be used.
Boiled Oil.....	20.4	

One pound of putty for stopping every 20 yards.

Glazier's Putty.

Whiting, 70 pounds; boiled oil, 30 pounds; water, 2 gallons. Mix. If too thin add more whiting; if too thick, add more oil.

Cement for Stopping Joints, Etc.

White lead in oil, mixed with enough white sand to make it a stiff paste. This grows hard by exposure, and resists heat, cold and water.

Cement for Leather Belting.

Take of common glue and American isinglass, equal parts; place them in a boiler and add water sufficient to cover the whole. Let it soak 10 hours, then bring it to a boiling heat, and add pure tannin until the whole becomes ropey or appears like the whites of eggs. Apply it warm. Buff the grain off the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for practical use; and, if properly put together, it will not need riveting, as the cement is nearly of the same nature as the leather itself.

To Remove Rusty Bolts.

To remove bolts that have become rusted badly, without breakiug them, is quite simple if understood. The best method is to apply kerosene oil liberally, and give time for it to soften the rust before any attempt is made to turn the nut. If, after the rust has softened, it does not start easily with the wrench, give a rap on one corner with a blow of the hammer. A hammer and cold chisel rightiy used will often start a rusted nut that would not yield to the wrench without twistiug off the bolt.

How to Prepare Fence Posts.

A western farmer says that he discoverd many years ago that wood could be made to last longer than iron in the ground. Time and weather, he says, seem to have no effect on it. Posts can be prepared for less than two cents apiece. This is the recipe: Take boiled linseed oil and stir it in pulverized charcoal to the consistency of paint. Put a coat of this over the timber, afid, he adds, there is not a man that will live to see it rot.

A Practical Rule for Laying Pipe for Draining Land.

Soils.	Depth of Pipe.	Distance apart.
Coarse Gravel Sand	4 feet 6 inches	60 feet.
Light Sand with Gravel	4 "	50 "
Light Loam	3 " 6 "	33 "
Loam with Clay	3 " 2 "	21 "
" " Gravel	3 " 3 "	27 "
Sandy Loam	3 " 9 "	40 "
Soft Clay	2 " 9 "	21 "
Stiff "	2 " 6 "	15 "

Greatest Fall of Rain is 2 inches per hour=54303.6 galls. per acre.

WORKSHOP RECIPES--CEMENTS FOR IRON.

To Mend Iron Pots.

Take two parts sulphur, and one part, by weight, of fine black lead; put the sulphur in an old iron pan, holding it over the fire until it begins to melt, then add the lead; stir well until all is melted; then pour out on an iron plate or smooth stone. When cool, break into small pieces. A sufficient quantity of this compound being placed upon the crack of the iron pot to be mended, can be soldered by a hot iron in the same way that a tinsmith solders his sheets. If there is a small hole in the pot, drive a copper rivet in it and then solder it with this cement.

Cement for Annealing Boxes.

Iron filings, 100 parts; lime milk, 40; quartz sand, 50; vinegar, 20. These are worked with water into a paste to which may be added, to render the mass more porous, hair, sawdust, etc.

Iron Cement for Hermetically Closing Stove Doors.

Finest iron filings, 100 parts; sal ammoniac, 10; limestone, 10; soluble glass solution, 10. These are mixed with water to a thick paste, which is applied at once, and is left to dry slowly before heating.

Cement for Broken Iron Vessels.

Iron filings, 10 parts; clay, 60. These are worked with linseed oil into a thick paste, which is applied after some more linseed oil has been added to it, and left to dry slowly.

Rust Cement for Iron.

Wrought-iron filings, 65 parts; sal ammoniac, 2½; sulphur (flour), 1½; sulphuric acid, 1. The solid ingredients are mixed dry, sulphuric acid diluted with sufficient water being then added. This cement dries after two or three days, and unites with the iron, making a very resisting and solid mass.

Cement for Filling Faults in Castings.

Iron filings, free from rust, 10 parts; sulphur, ½; sal ammoniac, 0.8. These are mixed with water to a thick paste, which is rammed into the "faults." This becomes strong when the iron filings are rusted. The parts which have to be cemented are treated before the operation with liquid ammonia, so as to be perfectly free from grease.

Fire-Proof Cement.

(1) Iron filings, 140 parts; hydraulic lime, 20; quartz sand, 25; sal ammoniac, 3. These are formed into a paste with vinegar, and then applied. This cement is left to dry slowly before heating. (2) Iron filings, 180 parts; lime, 45; common salt, 8. These are worked into a paste with strong vinegar. The cement must be perfectly dry before heated. By heating it becomes stone-hard.

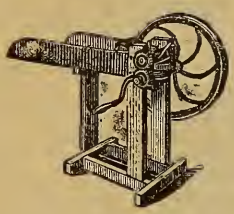
Iron Cement for High Temperatures.

(1) Iron filings, 20 parts; lime powder, 45; borax, 5; common salt, 5; permanganate of potash, 10. The borax and salts are dissolved in water, and are then mixed with the two first-named ingredients as quickly as possible and used. This cement changes at a white heat to a glassy mass, which is perfectly air-proof. (2) Permanganate, 25 parts; zinc white, 25; borax, 5. These are treated with a solution of soluble glass, and used at once. This cement must be left to dry slowly, and then it will resist the highest temperatures.

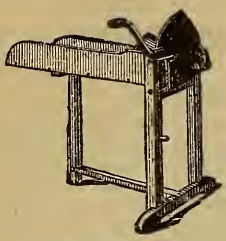
Cement for Gas Retorts.

For cementing earthenware gas retorts, which have to withstand very high temperatures, the following cement can be used: Powdered glass, 5 parts; chamotte meal, 5; powdered borax, 1. Chamotte meal is obtained by pulverizing broken pieces of gas retorts. This cement is a hard glass which only melts at the highest temperature, and then closes the leaks in the retort. To render the iron retort cover which closes the retort air-tight, a cement is used consisting of schwerspath powder, to which as much soluble glass has been mixed as to obtain a paste of sufficient strength.

Headquarters for Agricultural Implements.



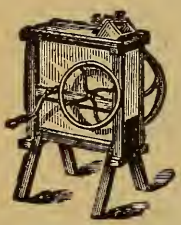
Copper Strip Feed Cutters.



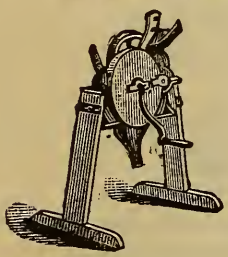
Lever Feed Cutters.

Family Cider Mill.

Union Cider Mill.



Clinton Sheller,



Burrall Sheller.

Wagon Jack.

Store Trucks.

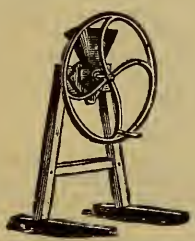
Champion Barrows.

Canal Barrows.

Garden Barrows.

Feed Box.

Hay Rack.



Corn Mill.

Cultivators.

Presses.

Apex Harrow

Lawn Rollers.

Road Scrapers.

Press Screw

We have the finest and best illustrated Agricultural Implement Catalogue in this country, which we furnish to dealers only, on application. We sell our goods which are second to none, at the very lowest market price. Address

METROPOLITAN AGRICULTURAL WORKS,

H. B. GRIFFING, *70 Cortlandt St., NEW YORK.*

Plants or Trees.

NUMBER TO THE ACRE AT GIVEN DISTANCES.

Dis. apart.	No. Plants.	Dis. apart.	No. Plants.
½ foot	174,240	6 feet	1,210
1 "	43 560	7 "	889
1½ feet	19,360	8 "	680
2 "	10,890	9 "	573
2½ "	6,969	10 "	435
3 feet by 1 foot	14,520	11 "	360
2 " 2 feet	7,260	12 "	302
3 " 3 "	4,840	15 "	193
4 " 1 foot	10,888	18 "	134
4 " 2 feet	5,444	20 "	108
4 " 3 "	3,629	25 "	69
4 " 4 "	2,722	30 "	49
5 " 5 "	1,742		

Customary and Legal Weight of Various Articles in the United States.

	lbs.		lbs.
Apples, per bu.	48	Onions, per bu.	56
" dried, "	24	Peas, "	60
Barley, "	48	Plastering Hair, "	8
Beans, "	60	Rape, "	50
Buckwheat, "	48	Rye, "	56
Broom Corn, "	46	Red Top Seed, "	14
Blue Grass, Kentucky "	14	Salt, Coarse, "	50
" " English, "	24	Salt, Michigan, "	56
Bran, "	20	Sweet Potatoes, "	56
Canary Seed, "	60	Timothy Seed, "	45
Castor Beans, "	46	Turnips, "	55
Clover Seed, "	64	Wheat, "	60
Corn, shelled, "	56	Beef and Pork, per bbl., net	200
" on ear, "	70	Flour, per bbl, net	196
Corn Meal, "	50	White Fish and Trout, per bbl., net	200
Charcoal, "	22	Salt, per bbl	280
Coal, Mineral, "	80	Lime, "	220
Cranberries, "	40	Hay, well settled, per cubic ft.	4½
Dried Peaches, "	28	Corn, on cob, in bin, "	22
Flax Seed, "	55	Corn, shelled, " "	45
Hemp Seed, "	44	Wheat, " "	48
Hungarian Grass Seed "	50	Oats, " "	25½
Irish Potatoes, heaping measure, "	60	Potatoes, " "	38½
Millet, "	50	Sand, dry, "	95
Malt, "	34	Clay, compact, "	135
Oats, "	32	Marble, "	169
Osage Orange, "	33	Seasoned Beech Wood, per cord	5,616
Orchard Grass, "	14	" Hickory, "	6,960

QUANTITY OF SEED REQUIRED

TO PRODUCE A GIVEN NUMBER OF PLANTS AND SOW A GIVEN AMOUNT OF GROUND.

	Quantity per acre.
Artichoke, 1 oz. to 500 plants....	½ lb.
Asparagus, 1 oz. to 200 plants ..	5 lbs.
Barley.....	2½ bu.
Beans, dwarf, 1 quart to 150 feet of drill.....	1¼ "
Beans, pole, 1 quart to 200 hills..	½ "
Beet, garden, 1 oz. to 100 feet of drill.....	10 lbs.
Beet, Mangel, 1 oz. to 150 feet of drill.....	6 "
Brocoli, 1 oz. to 3,000 plants.....	5 oz.
Broom Corn.....	10 lbs.
Brussels Sprouts, 1 oz. to 3,000 plants.....	5 "
Buckwheat.....	½ bu.
Cabbage, 1 oz. to 3,000 plants....	5 oz.
Carrot, 1 oz. to 250 feet of drill..	2½ lbs.
Cauliflower. 1 oz. to 3,000 plants.	5 oz.
Celery, 1 oz. to 10,000 plants. ...	4 "
Clover, Alsike and White Dutch	6 lbs.
" Lucerne, Large Red and Crimson Trefoil.....	8 "
" Medium.....	10 "
Collards, 1 oz. to 2,500 plants....	6 oz.
Corn, sweet, 1 quart to 500 hills .	8 qts.
Cress, 1 oz. to 150 feet of drill...	8 lbs.
Cucumber, 1 oz. to 80 hills.....	1¼ "
Egg Plant, 1 oz. to 2,000 plants .	8 oz.
Endive, 1 oz. to 300 feet of drill.	3 lbs.
Flax, broad cast.....	½ bu.
Garlic, bulbs, 1 lb. to 10 feet of Drill.....	
Gourd, 1 oz. to 25 hills.....	2½ "
Grass, Blue Kentucky.....	2 bu.
" Blue English	1 "
" Hungarian and Millet....	½ "
" Mixed Lawn.....	3 "
" Orchard, Perennial Rye, Red Top, Fowl Meadow and Wood Meadow	2 "

	Quantity per acre.
Hemp.....	½ bu.
Kale, 1 oz. to 3,000 plants.....	4 oz.
Kohl Rabi, 1 oz. to 200 feet of	1½ lbs.
Leek, 1 oz. to 250 feet of drill....	4 "
Lettuce, 1 oz. to 250 feet of drill.	3 "
Martynia, 1 oz. to 50 feet of drill	10 "
Melon, Musk, 1 oz. to 100 hills...	1¾ "
Melon, Water, 1 oz. to 25 hills...	1½ "
Nasturtium, 1 oz. to 50 feet of drill	10 "
Oats.....	2½ bu.
Okra, 1 oz. to 50 feet of drill.....10	lbs.
Onion Seed, 1 oz. to 200 feet of drill.....	5 "
" " for Sets.....	30 "
Onion Sets, 1 quart to 20 feet of drill.....	8 bu.
Parsnip, 1 oz. to 250 feet of drill.	5 lbs.
Parsley, 1 oz. to 250 feet of drill.	8 "
Peas, garden, 1 quart to 150 feet of drill.....	1½ bu.
" field.....	2½ "
Pepper, 1 oz. to 1,500 plants	4 oz.
Potatoes	8 bu.
Pumpkin, 1 quart to 300 hills....	4 qts.
Radish, 1 oz. to 150 feet of drill..	8 lbs.
Rye.....	1½ bu.
Salsify, 1 oz. to 60 feet of drill...	8 lbs.
Spinage, 1 oz. to 150 feet of drill.	10 "
Summer Savory, 1 oz. to 500 feet of drill.....	2 "
Squash, summer, 1 oz. to 40 hills	2 "
" winter, 1 oz. to 10 hills..	3 "
Tomato, 1 oz. to 3,000 plants	3 oz.
Tobacco, 1 oz. to 5,000 plants....	2 "
Turnip, 1 oz. to 250 feet of drill..	1½ lbs.
Vetches.....	2 bu.
Wheat	1 to 2 "

Velocity and Force of the Wind.

Description.	Miles per Hour.	Feet per minute.	Feet per second,	Force in lbs. per sq. foot.
Hardly perceptible.....	1	88	1.47	.005
Just perceptible.....	2	176	2.93	.020
	3	264	4.4	.044
Gentle Breeze.....	4	352	5.87	.079
	5	440	7.33	.123
Pleasant Breeze	10	880	14.67	.492
	25	1320	22	1.107
Brisk Gale	20	1760	29.3	1.968
	25	2200	36.6	3.075
High Wind.....	30	2640	44.	4.428
	35	3080	51.3	6.027
Very high Wind.....	40	3520	58.6	7.872
	45	3960	66.	9.963
Storm.....	50	4400	73.3	12.300
Great Storm.....	60	5280	88.	17.712
	70	6160	102.7	24.108
Hurricane.....	80	7040	117.3	31.488
	100	8800	146 6	49.200

Dimensions of Cylindrical Vessels.

It will be useful for tinners to know how to calculate the contents in gallons of cylindrical vessels. This is easily done by this formula: Square the diameter (in inches and decimal parts of an inch), multiply it by the height, then multiply the product by .0034 for wine gallons, or by .002785 for beer gallons.

Tinners are often called upon to construct a can or other cylindrical vessel to contain a certain number of gallons. The following table, furnished by an experienced tinner, gives the dimensions of cylindrical vessels which cut to advantage from tin or galvanized iron:

Gallons.	Diameter.	Height.	Gallons.	Diameter.	Height.
1	6¾	6¾	30	18½	26½
2	8½	8¾	35	18⅓	30½
3	9	11½	40	18¾	34
4	10⅓	13¾	50	20½	35
5	11½	11½	60	22½	38
6	11½	13½	70	23	40
10	13⅓	16½	80	24½	40
15	15½	19	90	24⅔	45
20	16	23	100	26	45
25	18	23			

Table of Dimensions of Various Measures of Capacity.

Size.	Diameter of Top.	Diameter of Bottom.	Height.
	Inches.	Inches.	Inches.
1 gallon.	5½	6⅛	9¼
½ "	4	4⅞	8
1 quart.	3½	4	5¾
1 gallon.	4	7	8½
½ "	6½	4	4
5 "	8	11½	12⅞
3 "	7	11⅝	10¼
2 "	6	10½	8⅞
1 "	3¾	8¾	7¾
20 quarts.	19½	13	8
16 "	18	11¼	6¼
14 "	15¼	9¼	6¼
10 "	14¾	11	4⅛
1 pint.	2⅞	3⅛	4¼
½ "	2⅜	2⅞	3⅛
3 quarts.	3½	6	8½
1 pint.	4¼	3¾	2¾
½ gallon.	3⅝	6⅝	6¼
1 "	2½	5⅛	5
1 "	2	4⅛	4⅛
½ "	1¾	3¼	3⅛
2 quarts.	9	6	3¾
3 pints.	8¼	5¾	2¾
1 pint.	6¼	4	2¾
Pie.	9	7½	1¾

Capacity of Boxes.

A box 24 by 16 inches and 28 inches deep will contain 5 bushels.
A box 24 by 16 inches and 14 inches deep will contain 2½ bushels.
A box 14 by 23⅕ inches and 10 inches deep will contain 1½ bushels.
A box 16 inches square and 8⅜ inches deep will contain 1 bushel.
A box 16 by 8⅜ inches and 8 inches deep will contain ½ bushel.
A box 8 inches square and 8⅜ inches deep will contain 1 peck.
A box 8 by 8⅜ inches and 4 inches deep will contain 1 gallon.
A box 8 by 4 inches and 4⅛ inches deep will contain ½ gallon.
A box 4 inches square and 4⅛ inches deep will contain 1 quart.

When you order to get the best, ask for

John Sommer's "PEERLESS" Faucets.

Best Block Tin Key, Maple Wood Body, Highly Polished, with Leather Lining.

For Sale in every City by the Leading Jobbers in Hardware, Woodenware, Groceries & Liquor.

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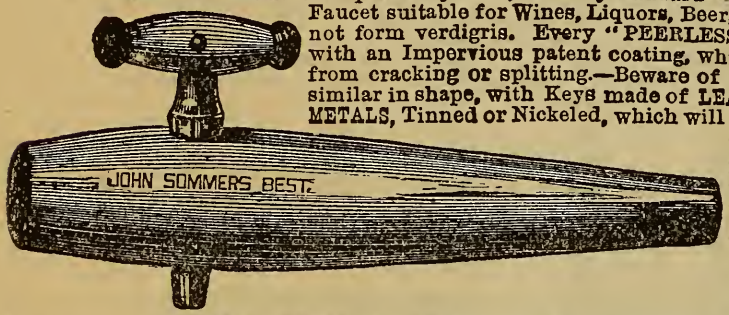

Only the Genuine are Stamped in the wood with our trade mark "Maltese Cross" on one side, and on the opposite side with our old brand with full name.

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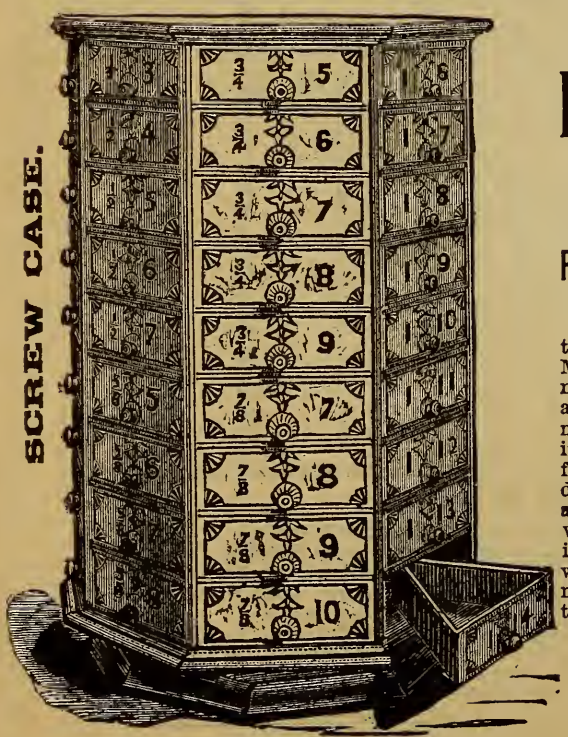

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DAYTON, OHIO,

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The American Bolt and Screw Case Co. of Dayton, O., are the only manufacturers of these Cases. Many improvements have been added to them, making them now as perfect and complete, as well as ornamental, as could be desired. They are now using iron standards, screwed firmly into an iron hub, in the bottom, which makes them perfectly true and solid. The tops and bottoms are double, with the grain of the wood crossed, glued and screwed together, and braced with iron rods, which bind the whole firmly together; thus making it strong enough to bear three times the weight that can be put into it; and by which means they revolve perfectly true and easy; and they are giving universal satisfaction.

SEND FOR CIRCULAR.

ALL CASES GUARANTEED.

Capacity of Cylindrical Cisterns or Tanks,

FOR EACH FOOT OF DEPTH.

Diameter in feet.	Gallons.	Pounds.	Diameter in feet.	Gallons.	Pounds.
2.0	23.5	196	9.0	475.9	3,968
2.5	36,7	306	9.5	530.2	4,421
3.0	52.9	441	10.0	587.5	4,899
3.5	72.0	600	11.0	710.9	5,928
4.0	94.0	784	12.0	846.0	7,054
4.5	119.0	992	13.0	992.9	8,280
5.0	146.9	1,225	14.0	1,151.5	9,602
5.5	177.7	1,482	15.0	1,321.9	11,023
6.0	211.5	1,764	20.0	2,350.1	19,596
6.5	248.2	2,070	25.0	3,672.0	30,620
7.0	287.9	2,401	30.0	5,287.7	44,093
7.5	330.5	2,756	35.0	7,197.1	60.016
8.0	376.0	3,135	40.0	9,400.3	78,388
8.5	424.5	3,540	. .	. . .	. . .

Rule for Measuring the Capacity of a Circular Cistern.

Multiply the square of the diameter by .7854, or the square of the circumference by .07958, in order to find the area of the cistern, then multiply the area by the depth in inches, and divide the product by 231. The quotient will equal the number of gallons the cistern will contain.

In measuring cisterns, etc., 31½ gallons are estimated to one barrel; 63 gallons to one hogshead.

Capacity of Cisterns in Barrels (31½ Gals.)

Depth 1 foot.		Depth 1 foot.	
Diameter.	Barrels.	Diameter.	Barrels.
Feet, 2	.74	Feet, 8½	13.47
" 2½	1.16	" 9	15.11
" 3	1.70	" 9½	16.81
" 3½	2.28	" 10	18.65
" 4	2.98	" 11	22.56
" 4½	3.77	" 12	26.85
" 5	4.66	" 13	31.61
" 5½	5.64	" 14	36.55
" 6	6.71	" 15	41.96
" 6½	7.88	" 20	74.60
" 7	9.13	" 25	116.57
" 7½	10.49	" 30	167.86
" 8	11.93		

Rule for Measuring the Capacity of a Square Cistern.

Multiply the length in feet by the width in feet, and multiply that by 1.728, then divide by 231. The quotient will be the number of gallons capacity of one foot in depth.

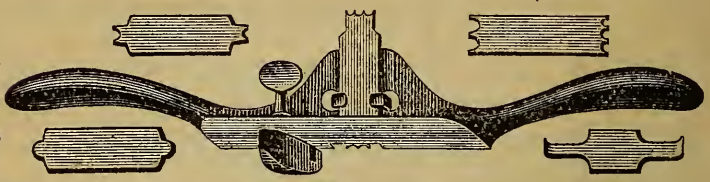
SAMPLES OF
STANLEY'S IMPROVED LABOR-SAVING TOOLS.

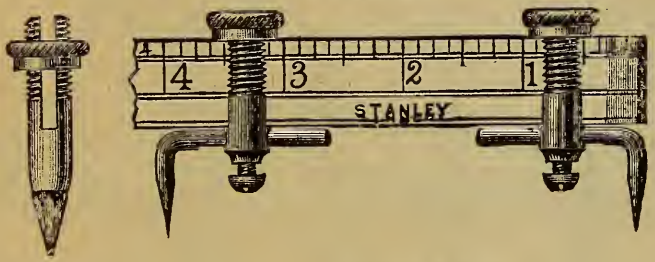
UNIVERSAL Hand Beader

NO. 66

With Seven Steel Cutters

$1.00





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NO. 99,

Per Set of Three,

$0.50.

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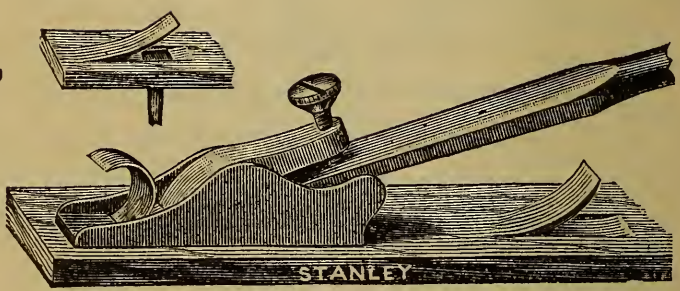
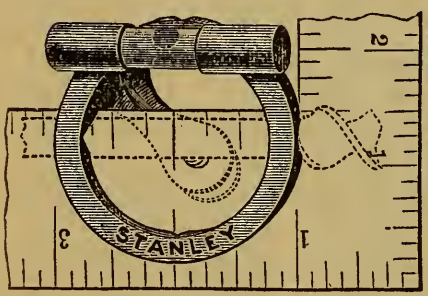
For Blind Nailing,

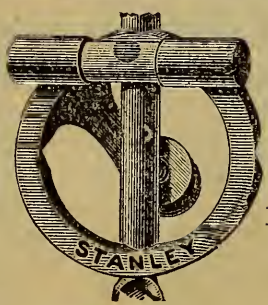
No. 96,

WITH STEEL STOCK,

$0.20.







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NO. 72,

Cast Iron Stock, $ 2.00.

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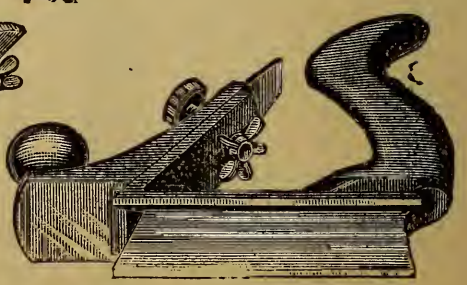
$3.00.



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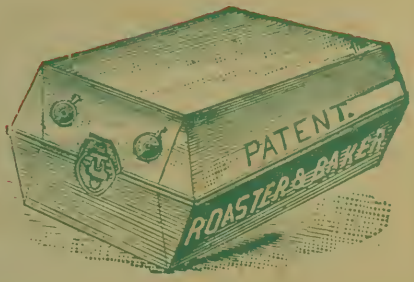
AND



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Put Your Finger Rig

60, 10, 10, 7½ & 2½.

Same as { 55, 20, 10, 7½ & 2½. / 50, 20, 10, 10, 7½ & 2½. / 40, 40, 10, 7½ & 2½. / 40, 35, 10, 10 & 7½. } { 40, 33⅓, 10, 10, 7½ & 2½. / 40, 25, 20, 10, 7½ & 2½. / 37½, 20, 20, 10, 10, 7½ & 2½. / 35, 25, 20, 10, 10 & 7½. }

1	00.29 22	11	03.21 43	21	06.13 64	31	09.05 84	41	11.98 05	51	14.90 26	61	17.82 47	71	20.74 67	81	23.66 88	91	26.59 09
2	00.58 44	12	03.50 65	22	06.42 86	32	09.35 06	42	12.27 27	52	15.19 48	62	18.11 69	72	21.03 89	82	23.96 10	92	26 88 31
3	00.87 66	13	03.79 87	23	06.72 08	33	09.64 28	43	12.56 49	53	15.48 70	63	18.40 91	73	21.33 11	83	24.25 32	93	27.17 53
4	01.16 88	14	04.09 09	24	07.01 30	34	09.93 51	44	12.85 71	54	15.77 92	64	18.70 13		62 34	84	24.54 54	94	27.46 75
5	01.46 10	15	04.38 31	25	07.30 52	35	10.22 73	45	13.14 93	55	16.07 14	65	18.99		1 56	85	24.83 76	95	27.75 97
6	01.75 32	16	04.67 53	26	07.59 74	36	10.51 95	46	13.44 15	56	16.36 36	66	19.2		78	86	25.12 98	96	28.05 19
7	02.04 55	17	04.96 75	27	07.88 96	37	10.81 17	47	13.73 38	57	16.65 58	67	19		00	87	25.42 21	97	28.34 41
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9	02.62 99	19	05.55 19	29	08.47 40	39		49	14.31 82	59	17.24 02	69			44	89	26.00 65	99	28.92 85
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60, 10

20, 10, 7½ & 5. / ½, 20, 10, 10 & 7½ / 0, 10, 10, 7½ & [illegible]

87½, 20, 20, 10, 10, 7½ & 5. / 83⅓, 33⅓, 10, 10, 10, 7½ & 5. / 33⅓, 25, 20, 10, 10, 7½ & 5.

									7 33	51	14				20.21 48	81	23.06 19	91	25 90 91
									80	52					20.49 95	82	23.34 66	92	26.19 38
									27	53					20.78 42	83	23.63 13	93	26.47 85
									5	5					21.06 89	84	23.91 61	94	26.76 32
															21.35 36	85	24.20 08	95	27.04 79
															21.63 83	86	24.48 55	96	27.33 26
															21.92 51	87	24.77 02	97	27.61 74
															22.20 78	88	25.05 49	98	27.90 21
															22.49 25	89	25.33 96	99	28.18 68
															22.77 72	90	25.62 43	100	28.47 15

Same

½, 20, 20, 10, 10, 7½, 5 & 2. / ⅓, 10, 10, 10, 7½, 5, 2. / , 25, 20, 10, 10, 7½, 5 & 2.

			05.85 94	31	08										22.60 07	91	25.39 09
2			06.13 85	32	0										22.87 97	92	25.66 99
3			03.62 73	33	06.41 75	33	0								23.15 87	93	25.94 89
4	0	31	14	03.90 63	24	06.69 65	34								3.43 77	94	26.22 79
5	01.39 51	15	04.18 53	25	06.97 55	35									71 68	95	26.50 70
6	01.67 41	16	04.46 43	26	07.25 45	3									9 58	96	26.78 60
7	01.95 31	17	04.74 34	27	07.53 36	3									7 48	97	27.06 50
8	02.23 22	18	05.02 24	28	07.81 26	3									5 38	98	27.34 40
9	02.51 12	19	05.30 14	29	08.09 16	3									3 28	99	27.62 30
10	02.79 02	20	05.58 04	30	08.37 06	3									1 19	100	27.90 21

60, 10, 10, 7½

7½ & 5. / 10, 7½, 5 & 2½. / 0, 7½, 5 & 2½. / 10, 10, 7½ & 5.

1	00.27 76	11	03.05 36	21	05.82										22.48 54	91	25.26 13
2	00.55 52	12	03.33 12	22	06.10										22.76 30	92	25.53 89
3	00.83 28	13	03.60 88	23	06.38										23.04 06	93	25.81 65
4	01.11 04	14	03.88 64	24	06.66										23.31 82	94	26.09 41
5	01.38 80	15	04.16 40	25	06.93										23.59 58	95	26.37 17
6	01.66 56	16	04.44 16	26	07.21										23.87 34	96	26.64 93
7	01.94 32	17	04.71 92	27	07.49										24.15 09	97	26.92 69
8	02.22 08	18	04.99 67	28	07.77										24.42 85	98	27.20 45
9	02.49 84	19	05.27 43	29	08.05										24.70 61	99	27.48 21
10	02.77 60	20	05.55 19	30	08.32										24.98 37	100	27.75 97

...T BOOK.

ccurate,
Rapid,
Practical.

The hand points to the net of

73 cents,	21 cents.
$7.30	$2.13
$73.00	$21.33
$730.00	$213.31
$7,300.00	$2,133.11
$73,000.00	$21,331.10

Tables, reduced in size, from LADD'S DISCOUNT BOOK.

If the amount was, say $73.45, add the net of 45 cents, which the table shows is 13 cents, total net $21.46.